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Evidence for Universality in Phenomenological Emotion Response System Coherence

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The authors reanalyzed data from Scherer and Wallbott's (Scherer, 1997b; Scherer & Wallbott, 1994) International Study of Emotion Antecedents and Reactions to examine how phenomenological reports of emotional experience, expression, and physiological sensations were related to each other within cultures and to determine if these relationships were moderated by cultural differences, which were operationally defined using Hofstede's (2001) typology. Multilevel random coefficient modeling analyses produced several findings of note. First, the vast majority of the variance in ratings was within countries (i.e., at the individual level); a much smaller proportion of the total variance was between countries. Second, there were negative relationships between country-level means and long- versus short-term orientation for numerous measures. Greater long-term orientation was associated with lowered emotional expressivity and fewer physiological sensations. Third, at the individual (within-culture) level, across the 7 emotions, there were consistent and reliable positive relationships among the response systems, indicating coherence among them. Fourth, such relationships were not moderated by cultural differences, as measured by the Hofstede dimensions.

Keywords: emotion, culture, coherence, phenomenological aspects, multilevel modeling

Research on the phenomenological aspects of emotion has made important contributions to our understanding of emotions. Previous studies have demonstrated that several emotions can be differentiated according to their appraisal dimensions (Frijda, Kuipers, & ter Schure, 1989; Scherer, 1997a, 1997b); expressive behavior and physiological sensations (Scherer & Wallbott, 1994); action readiness (Frijda et al., 1989), action tendencies, goals, and actions (Roseman, Wiest, & Swartz, 1994); and subjective experience (Roseman et al., 1994; Scherer & Wallbott, 1994).

The idea that emotions are organized as discrete, qualitatively different states suggests that the various components of emotion—appraisals, subjective experience, physiological responses, expressive behaviors, and action tendencies—are related to each other systematically. One way to characterize these relationships has been the term *emotion response system coherence*. Such coherence, evidenced by covariation among the components, is important for understanding discrete emotions. Coherent responses prepare the organism to respond efficiently to the environment, enhance the reliability of emotion signals, and provide rapid coordination of social actions between individuals, such as family members, romantic partners, or bosses and subordinates.

The strongest evidence for such coherence comes from studies reporting positive relationships between emotional experience and facial expressions of basic emotions when emotions were actually elicited (Ekman, Davidson, & Friesen, 1990; Ekman, Friesen, & Ancoli, 1980; Ekman, Friesen, & O'Sullivan, 1988; Gosselin, Kirouac, & Dore, 1995; Matsumoto & Kupperbusch, 2001; Mauss, Levenson, McCarter, Wilhelm, & Gross, 2005; Rosenberg & Ekman, 1994; Ruch, 1993, 1995); studies of smiles and laughter and the experience of joy (Duchenne smiles), embarrassment (gaze aversion and control attempts), and amusement (Frank, Ekman, & Friesen, 1993; Hess, Banse, & Kappas, 1995; Keltner, 1995; Keltner & Bonanno, 1997; McGhee, 1977; Ruch, 1995; Smith, 1995); studies on the facial feedback hypothesis (Hess, Kappas, McHugo, & Lanzetta, 1992; Laird, 1974; Matsumoto, 1987; McIntosh, 1996; Soussignan, 2002; Winton, 1986); and studies reporting positive relationships between ratings of perceived expression intensity and inferences about subjective experiences across cultures (Matsumoto, Kasri, & Kooken, 1999). The research is not unequivocal, however; some studies have found weak or no relationships between experience and expression (Fernandez-Dols & Ruiz-Belda, 1995, 1997; Kraut & Johnson, 1979; Ruiz-Belda, Fernandez-Dols, Carrera, & Barchard, 2003; Schneider & Josephs, 1991; Schneider & Unzner, 1992; Soussignan & Schaal, 1996).

Studies examining the relationship between experience and expression with physiological reactions are less consistent. Early

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studies found relatively weak relationships (Mandler, Mandler, Kremen, & Sholiton, 1961; Weinstein, Averill, Opton, & Lazarus, 1968), but recent studies have found stronger links (Hubert & de Jong-Meyer, 1990). Ekman, Levenson, and Friesen (1983) demonstrated that facial expressions are linked with unique signatures in the autonomic nervous system. Similar links exist between expression and central nervous system activity (Ekman & Davidson, 1993; Ekman et al., 1990). These relationships tend to be low to moderate in size (Brown & Schwartz, 1980; Lang, Greenwald, Bradley, & Hamm, 1993). Recently, Mauss et al. (2005) reported strong within-person correlations between experience and expression (absolute value of the significant *r*s = .22–.51) and expression and physiology (absolute value of the significant *r*s = .19–.52).

The studies cited in the preceding two paragraphs examined emotions elicited in the laboratory. To our knowledge, however, only one report to date has examined coherence among phenomenological aspects of emotion responding. Frijda et al. (1989) asked Dutch students to recall an instance in which they experienced eight emotions. They rated each on multiple dimensions of appraisals and action readiness. Regression analyses indicated that the appraisal ratings accounted for, on average, 19% and 24% of the action tendencies' variance in both studies, respectively. Thus, although there is a small but growing literature on coherence examining emotions in the laboratory, there is a dearth of evidence examining the coherence among phenomenological aspects of emotional responding.

Importance of Testing Phenomenological Emotion Response System Coherence Across Cultures

Testing coherence among phenomenological aspects of emotional responding across cultures is important for several reasons. First, the only study to date to examine such coherence is Frijda et al.'s (1989), and in that study only two aspects of emotion—appraisals and action readiness tendencies—were examined. System coherence should exist across a broader range of emotional responses. We test that notion here using verbal utterances, nonverbal behaviors, two aspects of emotional experience, and three types of physiological sensations.

Second, a large literature (Averill, Chon, & Hahn, 2001; Ekman, 1992; Frijda et al., 1989; Izard, 1991; Scherer, 1997a; Scherer & Wallbott, 1994) suggests that the emotional states studied to date are shared universally (although there are differences in theoretical perspectives concerning the source of the universality, ranging from the bioevolutionary perspective of basic emotions to constructivist points of view). If discrete emotions are universal and response system coherence exists, then such coherence should be found in different cultural contexts. We test that notion here by examining coherence within a large sample of respondents across a wide range of countries and cultures.

Third, examining whether emotion response system coherence is moderated by culture is important theoretically because such findings can inform us about the source of unique phenomenologies associated with discrete emotions. Previous findings indicating unique self-reported physiological sensations associated with discrete emotional states (Frijda et al., 1989; Scherer & Wallbott, 1994) are suggestive of either a correspondence with an underlying, discrete biophysiological basis for emotion or socially shared constructions about emotional experience. In fact, Rime, Philippot, and Cisamolo (1990) demonstrated that the physiological profiles reported when emotion is actually aroused could be generated by asking participants to describe stereotypic changes that occur when emotion is aroused, suggesting that self-reports of actual emotional experience are socially constructed. Breugelmans et al. (2005), however, demonstrated that the same pattern of responding was obtained in two samples with very low exposure to Western cultures, arguing against a strong constructivistic viewpoint. An examination of coherence across cultures informs this debate because a strong constructivist viewpoint implies that coherence would differ in different sociocultural contexts. It is one thing to argue that mean levels of individual response are constructed, but coherence among responses implies a much stronger effect of social construction. If coherence is found across cultures, therefore, that would be evidence against the constructivist viewpoint. But if culture does moderate coherence, that would provide evidence for the influence of social construction in self-reported phenomenologies of emotional responding.

Description of the Data Set and Analytic Strategy

The study reported here reanalyzes data previously published in Scherer and Wallbott's (Scherer, 1997b; Scherer & Wallbott, 1994) International Study of Emotion Antecedents and Reactions (ISEAR), in which 2,921 participants in 37 countries across five continents completed a questionnaire about their reactions to seven emotions. A previous study using this data set (Scherer & Wallbott, 1994) demonstrated country differences on experience, verbal reactions, nonverbal reactions, and attempts to control expressive behavior. No report, however, has examined relationships among the various responses, nor the degree to which cultural variables moderated such relationships, which is what we do in this report. Our report, therefore, addresses important new questions on an existing data set that heretofore have not been addressed.

In addition, a reanalysis of this data set is timely because of the development of new statistical techniques that can better handle the ISEAR data structure. The data set constitutes a multilevel (or nested) data structure in that persons were nested within countries. Over the past 10 to 15 years, a consensus has emerged that a technique known as multilevel random coefficient modeling (MRCM) provides the most accurate parameter estimates for such hierarchically nested data (Bryk & Raudenbush, 1992; Nezlek, 2001, in press). The accuracy of the parameter estimates is based largely on the fact that MRCM uses maximum likelihood procedures to estimate parameters rather than traditional ordinary least squares approaches underlying analysis of variance or regression.

Within a multilevel framework, the present analyses are known as two-level models, one level representing individuals (Level 1), the other representing countries (Level 2). These analyses estimate means for each measure and the degree to which the means vary both within and between countries. The analyses also provide estimates of relationships (covariances) between variables within each country (i.e., at Level 1). Variables at Level 2 can be further used to estimate the degree to which mean levels of the variables at Level 1, or relationships between variables at Level 1, are related to variables at Level 2.

In this study, the country-level (Level 2) variables came from Hofstede's (2001) long-term study of cultural dimensions, in

which Hofstede reported data from 72 countries and defined his dimensions in the following manner:

- *Individualism versus collectivism* The degree to which cultures encourage people to look after themselves and their immediate family only or encourage people to belong to in-groups that are supposed to look after them in exchange for loyalty
- *Power distance* The degree to which cultures encourage less powerful members within groups to accept the fact that power is distributed unequally
- *Uncertainty avoidance* The extent to which people feel threatened by unknown or ambiguous situations and the extent to which they have developed beliefs, institutions, or rituals to avoid them
- *Masculinity versus femininity* The distribution of emotional roles between men and women, characterized on one end of a continuum by success, money, and things and on the other end by caring for others and quality of life
- *Long- versus short-term orientation* The degree to which a culture encourages delayed gratification of material, social, and emotional needs among its members

Although other sources of country-level cultural data exist (Bond et al., 2004; Schwartz, 2004), we use Hofstede's (2001) dimensions in this initial report because they are arguably the best-known and well-studied dimensions, they capture well the cultural diversity among countries of the world, they represent different aspects of culture, and they provide an excellent broad-stroke base that can be used to understand cultural variability.

Goals and Hypotheses

Using the ISEAR data set and MRCM techniques, we addressed four goals: (a) to reassess and replicate previous findings concerning between- and within-culture variability in means regarding phenomenological emotional responding; (b) to examine the relationships between country differences in means and the Hofstede (2001) cultural dimensions; (c) to examine within-culture relationships among the variables, assessing emotion response system coherence; and (d) to examine whether the relationships were moderated by culture.

Scherer and Wallbott (1994) previously found only small to moderate Country × Emotion interactions on subjective experience, physiological sensations, and verbal and nonverbal behaviors, the same variables we examine here (ηs ranging from .16 to .24). For this reason we, too, expect most of the mean variance to be attributed to within-country effects.

Still, there should be some between-country differences in means, and these should be related to culture. Previous studies have interpreted between-country differences in various emotion-related phenomena to occur because of cultural differences in individualism versus collectivism (Kitayama & Markus, 1994; Matsumoto & Ekman, 1989; Mesquita, 2001). On the one hand, members of collectivistic cultures express (Ekman, 1972; Matsumoto & Kupperbusch, 2001), and believe they express (Pittam, Gallois, Iwawaki, & Kroonenberg, 1995), basic emotions (i.e., anger, disgust, fear, happiness, sadness, and surprise) less than members of individualistic cultures. Members of collectivistic cultures also rate the expressions of these emotions less intensely (Biehl et al., 1997; Matsumoto & Ekman, 1989) and experience them less intensely (Matsumoto, Kudoh, Scherer, & Wallbott, 1988; Scherer, Matsumoto, Wallbott, & Kudoh, 1988). On the other hand, members of collectivistic cultures experience self-conscious emotions such as shame and guilt more strongly than members of individualistic cultures (Kitayama, Markus, & Matsumoto, 1995). Thus, we hypothesized that individualism is positively correlated with basic emotions, indicating greater emotional reactivity, while at the same time negatively correlated with shame and guilt.

As mentioned above, only one study (Frijda et al., 1989) has examined the coherence between self-reported emotional reactions. Other studies (reviewed above), however, have found such coherence among emotional experience, expressive behavior, and physiology. Thus, we predict that such coherence will be found in the ISEAR data set as well, in the form of significant, within-country relationships among the emotion variables.

Finally, culture may influence the relationships (coherence) among variables. This notion is supported by Matsumoto and Kupperbusch's (2001) finding that the relationship between subjective experience and emotional expression was positive for idiocentric individuals (i.e., those with individualistic tendencies) but negative for allocentric individuals (those with collectivistic tendencies) when experiencing strong emotions in the presence of an experimenter. This idea is also supported by cultural constructionist views of emotion that suggest emotional experience is fundamentally interrelated with culture (Kitayama et al., 1995) and studies within this framework that have shown that the relationship between emotional experiences and interpersonal concerns differ according to culture (Mesquita, 2001). Thus, we predict that the level of coherence among emotional responses is stronger in individualistic than collectivistic cultures.

Method

Emotion Data

The emotion data came from the ISEAR study described above (Scherer & Wallbott, 1994). Participants completed a two-page questionnaire about anger, disgust, fear, happiness, sadness, shame, and guilt. The questionnaire consisted of four parts. First, participants described the situation that elicited the emotion. Then they described their subjective feelings by rating the duration, intensity, and impact of the event on relationships with other people. Next, participants described their physiological symptoms, expressive reactions, and the degree to which they tried to control their reactions. Finally, participants answered questions related to their appraisals of the situation.

The data from the second and third parts of the questionnaire are analyzed here, and all scores were the same as those used in the Scherer and Wallbott (1994) report. Participants rated the intensity of their emotional experience using a 4-point scale (1 = *not very,* 2 = *moderately,* 3 = *intense,* and 4 = *very intense*). They also rated the degree to which they tried to control or hide their feelings using a 4-point scale (1 = *not at all,* 2 = *a little,* 3 = *very much,* and 0 = *not applicable*).

Expressive reactions were measured with a checklist of 11 nonverbal reactions and eight verbal utterances. Verbal behavior was computed by summing selections of silence, short utterance, one or two sentences, or lengthy utterance; these scores ranged

from 0 to 3. Nonverbal behavior was computed by summing selections of laughing–smiling, crying–sobbing, other facial expression changes, screaming–yelling, other voice changes, and changes in gesturing; these scores ranged from 0 to 6.

Physiological symptoms were measured with a checklist of 11 bodily symptoms. The symptoms were grouped into three categories: ergotropic arousal, which included change in breathing, heart beating faster, muscles tensing or trembling, and perspiring or moist hands (scores ranging from 0 to 4); trophotropic arousal, including lump in throat, stomach troubles, and crying or sobbing (scores ranging from 0 to 3); and felt temperature, including feeling cold or shivering, feeling warm or pleasant, and feeling hot or cheeks burning (0 being assigned when no temperature symptom was mentioned; scores ranging from −1 to 2). These categories were based on Gellhorn's (1970) classification, were used in Scherer and Wallbott's (1994) report, and are the variables in the database provided by Scherer at the following Website: http://www.unige.ch/fapse/emotion/databanks/isear.html

Culture Data

The culture data came from Hofstede's (2001) database. There are data on the original four dimensions from 50 countries and three regions; data on long-term orientation (LT) exist for 29 countries and two regions. In addition, index score estimates for another 16 countries were available in Hofstede; these were used for Bulgaria, China, and Poland. Scores were standardized before analysis. For this report, we had data on 36 countries for the four original Hofstede dimensions and on 25 countries for LT.

Analytic Strategy

The analyses were done using hierarchical linear modeling (Raudenbush, Bryk, Cheong, & Congdon, 2000). Hierarchical linear modeling provides the option to weight observations at either Level 1 or 2 (within or between countries in the present case). Given the differences in populations for the countries, Level 2 weights were used. Weighting simply by raw population was not appropriate, however, because the differences in populations were too large; raw population (in millions) was distributed with a mean of 102.4 million ($SD = 270.6$). For example, China and India had populations of more than 1.0 billion, whereas New Zealand had a population of approximately 4 million and Finland a population of approximately 5 million. A normal distribution of weights was obtained by dividing the raw population by 1.0 million and then taking the log of this ($M = 1.32$, $SD = 0.69$); all analyses were conducted using these transformed weights.[1]

Results

Variance Decomposition for All Variables

The first analyses were totally unconditional (null) models; that is, there were no predictors at either Level 1 or Level 2. These analyses estimated means and within- and between-country variances. The equations representing these analyses were as follows for Level 1 and Level 2, respectively: $y_{ij} = \beta_{0j} + r_{ij}$ and $\beta_{0j} = \gamma_{00} + u_{0j}$.

In the Level 1 model, β_{0j} is a random coefficient representing the mean of *y* for country *j* across the *i* persons in each country, and r_{ij} represents the deviation of each person from the mean of his or her country. The variance of r_{ij} constitutes the within-country variance. In the Level 2 (country-level) model, γ_{00} represents the grand mean of the country means (β_{0j}s) from the Level 1 model, u_{0j} represents the deviation of each country's mean from the grand mean for all countries, and the variance of u_{0j} constitutes the Level 2 (or between-country) variance.[2]

A summary of the initial, unconditional analyses is presented in Table 1. The vast majority (more than 90% in all cases, more than 95% in most cases) of the variance for all measures for all emotions was within countries, suggesting that there were only few, small differences between countries compared to differences within countries.

Relationships Between Country-Level Means and Hofstede (2001) Scores

We examined relationships between countries' scores on the Hofstede (2001) dimensions and coefficients describing the mean for each country (the intercepts from the Level 1 model). Two sets of analyses were done. The first included the four dimensions for which we had data for 36 countries: power distance (PD), uncertainty avoidance (UA), individualism versus collectivism (IN), and masculinity versus femininity (MF). Including these measures simultaneously adjusted the coefficients for the covariation among the scales (which was pronounced for PD and IN, $r = -.67$). We had data for only 25 countries for long- versus short-term orientation; thus, this dimension was analyzed separately.

The first analyses estimated means (intercepts in the multilevel framework) for each country using an unconditional model at Level 1. Hofstede (2001) scores were included at Level 2, uncentered because they had been standardized before analysis. The Level 2 model was as follows: $\beta_{0j} = \gamma_{00} + \gamma_{01}(UA) + \gamma_{02}(PD) + \gamma_{03}(IN) + \gamma_{04}(MA) + u_{0j}$.

Relationships between Hofstede (2001) scores and intercepts for the emotion variables were evaluated by the significance of these coefficients. The results are summarized in Table 2. Overall, there were negative relationships between LT and nonverbal expressions (six of seven emotions), verbal expressions (four emotions significant or marginally significant), trophotropic symptoms (three emotions significant or marginally significant), ergotropic symptoms (six of seven emotions), and felt temperature of fear. There were positive relationships between LT and felt temperature for four emotions (joy, sadness, shame, and guilt). In addition, there were positive relationships between UA and trophotropic symptoms (five of seven emotions).

Hierarchical linear modeling estimates unstandardized coefficients, meaning that coefficients represent the change associated

[1] Although weighted analyses were more appropriate, the results of unweighted analyses were similar to the results presented in this article.

[2] Initially, all coefficients (intercepts and slopes) were modeled as random. When necessary, coefficients were modeled as fixed (i.e., no random error term was estimated) according to guidelines that are standard for multilevel modeling. A description of these guidelines is available in Nezlek (in press), and a detailed description of the error terms that were and were not estimated in the present analyses can be obtained from John B. Nezlek. It should be noted that all intercepts in all analyses were modeled as random effects.

Table 1
Descriptive Statistics for All Variables

Emotion	Intercept	Between	Within	% Within	Intercept	Between	Within	% Within
	Verbal expression				Nonverbal expression			
Joy	2.00	0.08	0.93	92	1.49	.03	0.88	97
Fear	0.73	0.03	0.79	96	0.97	.05	0.95	95
Anger	1.64	0.09	1.20	93	1.37	.05	1.16	96
Sad	0.76	0.04	0.95	96	1.29	.08	1.03	93
Disgust	1.07	0.05	1.09	96	0.93	.04	0.79	95
Shame	0.86	0.02	0.87	98	0.94	.05	0.86	95
Guilt	0.91	0.04	1.03	96	0.81	.04	0.88	96
	Emotional intensity				Subjective control			
Joy	3.14	0.01	0.71	99	1.28	.01	0.27	96
Fear	3.07	0.04	0.78	95	1.87	.03	0.57	95
Anger	2.99	0.02	0.74	97	1.58	.01	0.51	98
Sad	3.18	0.02	0.72	97	1.85	.03	0.53	95
Disgust	2.68	0.04	0.88	96	1.67	.01	0.55	98
Shame	2.59	0.04	0.88	96	2.25	.03	0.52	95
Guilt	2.59	0.03	0.84	97	2.05	.02	0.57	97
	Trophotropic symptoms				Ergotropic symptoms			
Joy	0.16	0.01	0.16	94	0.79	.05	1.00	95
Fear	0.49	0.02	0.43	96	1.97	.12	1.65	93
Anger	0.33	0.02	0.31	94	1.49	.10	1.49	94
Sad	0.71	0.03	0.43	93	0.89	.09	1.30	94
Disgust	0.43	0.03	0.34	92	0.77	.06	1.10	95
Shame	0.34	0.01	0.33	97	1.02	.05	1.36	96
Guilt	0.41	0.02	0.37	95	0.79	.05	1.21	96
	Felt temperature							
Joy	0.86	0.02	0.50	96				
Fear	−0.05	0.03	0.88	97				
Anger	0.60	0.02	1.05	98				
Sad	−0.03	0.01	0.56	98				
Disgust	0.12	0.03	0.60	95				
Shame	0.74	0.12	1.10	90				
Guilt	0.27	0.05	0.75	94				

Note. "Between" columns contain estimates of the between-country variance, "Within" columns contain estimates of the within-country variance, and "% Within" columns contain the percentage of total variance within countries.

with a one-unit change in a predictor. Hofstede (2001) scores were standardized before analysis; thus, coefficients represent changes in dependent measures associated with a 1 standard deviation change in Hofstede scores. For example, for nonverbal expression of fear, LT had a coefficient of −.12. For every one-unit increase in country scores on LT, mean nonverbal expression of fear decreased .12.

The findings involving LT did not occur because it was analyzed separately from the other culture dimensions because LT was not correlated with any of the other four culture dimensions, either as bivariate correlations or in a simultaneous multiple regression. Thus, correlations between LT and other culture dimensions could not have accounted for the relationships between LT and the dependent measures.

The results for emotional intensity and subjective control were less clear. There were few significant relationships, and these formed no clear pattern.

Coherence Among Emotion Response Systems

Coherence was operationally defined in terms of linear relationships among the different types of response variables. These relationships were examined with the following Level 1, within-country model:

$$\text{Level 1: } y_{ij} = \beta_{0j} + \beta_{1j}(\text{Intensity}) + r_{ij}$$

$$\text{Level 2: } \beta_{0j} = \gamma_{00} + u_{0j}$$

and

$$\text{Level 2: } \beta_{1j} = \gamma_{10} + u_{1j}.$$

For example, in examining the relationship between the intensity of emotional experience and expression, a slope representing the relationship between expression and intensity was estimated (β_{1j}) for each country. Intensity was entered group mean centered;

Table 2
Relationships Between Hofstede's (2001) Cultural Dimensions With All Variables

Emotion	PD	UA	IN	MA	LT	PD	UA	IN	MA	LT
	Verbal expression					Nonverbal expression				
Joy						−.14*				
Fear	−.08*				−.15**					−.12**
Anger					−.09†					−.11**
Sad					−.10**					−.13**
Disgust		−.08†			−.08†					−.07**
Shame							.08†			−.07**
Guilt										−.13**
	Emotional intensity					Subjective control				
Joy					−.04*		−.04†			.02†
Fear					−.10**					−.07†
Anger										
Sad						.07†		.11*		
Disgust				−.06*						
Shame		−.09*				−.06*				−.13**
Guilt										−.09*
	Trophotropic symptoms					Ergotropic symptoms				
Joy		.05**	.05**							−.09*
Fear		.08**	.05†		−.09**		.11**			−.17**
Anger		.05*			−.04†	−.18†				
Sad		.09**								−.17**
Disgust						−.15**				−.13**
Shame					−.06**	.10*				−.12**
Guilt		.09**			−.07**					−.16**
	Felt temperature									
Joy				.05†	.05*					
Fear			.13**		−.09**					
Anger		−.08**								
Sad			−.05*		.05**					
Disgust										
Shame				.10*	.17**					
Guilt					.15*					

Note. Coefficients with $p > .10$ were not included. PD = power distance; UA = uncertainty avoidance; IN = individualism versus collectivism; MA = masculinity versus femininity; LT = long- versus short-term orientation.
* $p < .05$. ** $p < .01$. † $.05 < p < .10$.

thus, country-level differences in intensity did not contribute to parameter estimates. The mean relationship (across all countries) between expression and intensity was evaluated by the significance of the γ_{10} coefficient. If γ_{10} was significantly different from 0, then the mean relationship between expression and intensity was different from 0. Such coefficients are referred to as slopes in multilevel analyses.

The results are summarized in Table 3. There were positive relationships between intensity of emotional experience and nonverbal emotional expression for all seven emotions. In contrast, there were significant relationships between intensity and verbal expression only for anger and disgust. These coefficients were unstandardized; each represented how much a dependent measure changed for each one-unit increase in the predictor. For example, the coefficient (slope) for intensity in the analysis of expression of nonverbal sadness was .29. On average, across all countries, for every one-unit increase in emotional intensity, nonverbal expression of sadness increased .29.

Relationships between emotion intensity and physiological sensations were examined with a similar model, with individual physiological symptoms as independent measures at Level 1. Emotion intensity was positively related to trophotropic and ergotropic symptoms for all seven emotions and associated with felt temperature for four emotions (Table 3).

Relationships between expression and physiological symptoms were examined with the same model. Verbal expression was positively related to ergotropic symptoms for six emotions and with felt temperature for six emotions. Nonverbal expression was positively related to both trophotropic and ergotropic symptoms for all emotions and to felt temperature for four emotions (Table 3).

Relationships between verbal and nonverbal expressions were structurally similar to the above analyses except that verbal ex-

Table 3
Mean Within-Country Relationships Demonstrating Coherence Between Emotional Response Systems

Emotion	Emotion intensity and expression		Verbal and nonverbal expression	Emotion intensity and physiology		
	Verbal	Nonverbal		Trophotropic symptoms	Ergotropic symptoms	Felt temperature
Joy		.20**	.13**	.26**	.13**	.11**
Fear		.23**	.24**	.16**	.14**	−.04*
Anger	.10**	.21**	.25**	.20**	.18**	.05**
Sad		.29**	.15**	.22**	.17**	
Disgust	.06**	.15**	.23**	.25**	.24**	
Shame		.13**	.21**	.30**	.18**	−.04**
Guilt		.22**	.26**	.29**	.18**	

	Verbal expression and physiology			Nonverbal expression and physiology		
	Trophotropic symptoms	Ergotropic symptoms	Felt temperature	Trophotropic symptoms	Ergotropic symptoms	Felt temperature
Joy	−.13*		.07**	.22**	.28**	.22**
Fear		.04**	.04**	.26**	.22**	
Anger	−.07†	.14**	.10**	.33**	.33**	.10**
Sad		.08**	.09**	.31**	.30**	
Disgust		.10**	.10**	.21**	.32**	.07*
Shame		.04*	.03†	.23**	.26**	.11**
Guilt		.08**	.10**	.25**	.31**	.06†

	Subjective control and expression	
	Verbal	Nonverbal
Joy	−.37**	−.17**
Fear	−.14**	.06†
Anger	−.49**	−.15**
Sad	−.11**	
Disgust	−.39**	−.11**
Shame	−.20**	
Guilt	−.21**	−.07**

* $p < .05$. ** $p < .01$. † $.05 < p < .10$.

pression was the dependent measure and nonverbal expression was the predictor. Nonverbal expression was entered group mean centered. Verbal and nonverbal expression were positively related for all seven emotions (Table 3).

Relationships between subjective control and expression were examined by using models that were structurally similar to those used to examine relationships between the other variables above. Control was entered group mean centered. There were significant, negative relationships between verbal expression and control for all seven emotions. The slopes for anger, disgust, and joy in particular were high. The pattern of results was similar but weaker for nonverbal expression, with four emotions producing significant results, and those that were significant were substantially smaller than the slopes for verbal expression (Table 3).

Does Culture Moderate Response System Coherence?

To examine if culture moderated the within-country relationships reported in Table 3, a series of analyses were done in which the within-country coefficients (the β_{1j} coefficients from the initial analyses) were modeled at Level 2 as a function of Hofstede (2001) scores. The results of these analyses followed no clear pattern. Although Hofstede scores were related to mean levels of many of the measures, there were few significant relationships between Hofstede scores and the slopes described in the previous analyses. Moreover, the few significant relationships that did occur followed no clear pattern (table of results available from David Matsumoto).

Discussion

There are several findings of note in this study. First, the vast majority of variance in the data set was due to individual differences within countries; a much smaller proportion of that total variance, less than 5% in most cases, was due to between-country differences. Second, cultures were associated with mean differences. Third, there were consistent and reliable relationships among the variables, indicating coherence among the emotion response systems. Fourth, these relationships were not moderated by culture.

This study was not conducted without limitation, one of which concerned the culture data. Limitations of Hofstede's (2001) cul-

ture dimensions, especially individualism versus collectivism, have been discussed (Bond et al., 2004; Oyserman, Coon, & Kemmelmeier, 2002; Schwartz, 2004). Moreover, they represent values originally assessed in the workplace, and values are only one part of subjective culture. Still, we contend that the Hofstede dimensions provide the best broad-stroke view of culture and are the most well studied. Moreover, they are highly correlated with other sets of available country-level data. Individualism, for instance, is highly correlated with Schwartz's (2004) affective autonomy and egalitarianism and with country-level differences in extraversion and openness (Hofstede & McCrae, 2004). Thus, it is very likely that even if other authors' cultural dimensions were used, the same pattern of results would have been obtained on similar cultural dimensions.

The lack of cultural differences in relationships among the emotion variables represents accepting the null hypothesis and raises questions about power. Unfortunately, power analyses for multilevel analyses are complex and not thoroughly understood at present, and the modeling procedures we used leaves us uncertain as to whether the present data set provided high power to detect cultural differences in within-country relationships.[3]

With these caveats in mind, the results of the variance decomposition analyses are sobering to anyone interested in the relationship between culture and emotion. Many studies, especially those conducted within a social-constructionist framework, have implied that culture exerts a strong influence on emotions. Kitayama and Markus (1994), for instance, speculated about the "mutual constitution" of culture, emotion, and personality, suggesting that emotions can only be understood in their unique cultural milieu. Even outside this framework, when cultural differences are found, it is easy to assume that those differences are large, accounting for substantial portions of variance among individuals. Our data, however, suggest that the variance accounted for by country or culture is not very large and that the bulk of variability found is more aptly ascribed to individual rather than cultural differences.

The country differences that did occur were related to culture. In particular, cultures with long-term, compared to short-term, orientations had fewer verbal and nonverbal expressions and physiological sensations. A typical interpretation of these findings would suggest that long-term-oriented cultures may have greater needs to curb emotional reactions to maintain a longer term focus on daily events. In this view, high emotional reactivity is potentially more disruptive to such plans, and cultures with more short-term focus have greater freedom to express and experience transient emotions.

However, long-term-oriented cultures also had lower means on several emotion intensity and subjective control variables, indicating that their members had somewhat less intense experiences to begin with and exerted less subjective control over their reactions. This suggests, therefore, that it is not that members of long-term-oriented cultures actively suppress their reactions, but that members of short-term-oriented cultures experience emotions more intensely, exert relatively more subjective control over them, and produce more verbal and nonverbal expression and heightened physiological sensations. This alternative interpretation, in fact, is supported by data from several extant sources. First, countries high on Hofstede's (2001) LT tend to be negatively associated with country-level differences on extraversion (McCrae, 2002), suggesting that members of short-term-oriented cultures may experience emotions more intensely because of aggregate differences in personality. Second, emotional experiences figure more prominently in the lives of people from short-term-oriented cultures (Suh, Diener, Oishi, & Triandis, 1998). Third, members of short-term-oriented cultures exaggerate their ratings of the intensity of emotional expressions relative to judgments of actually felt emotions, but members of long-term-oriented cultures do not (Matsumoto et al., 1999). In short, members of long-term-oriented cultures may not suppress their emotional responses; instead, members of short-term-oriented cultures may be more emotional.

That long- versus short-term orientation was related to many more aspects of emotional responding compared with individualism versus collectivism is an interesting finding. As mentioned above, many previous studies (Kitayama & Markus, 1994; Matsumoto & Ekman, 1989; Mesquita, 2001) have used the individualism versus collectivism framework to interpret cultural differences. The current findings suggest that a more important cultural dimension is long- versus short-term orientation. These findings are also congruent with a recent, 30-country study of cultural display rules of emotional expression (Matsumoto et al., 2005), which highlighted the importance of this dimension in predicting country differences in display rules. This dimension may have been overlooked in the past because of the field's preoccupation with individualism versus collectivism and the fact that different cultural dimensions were not tested against each other in the previous studies, as we did here.

There were a number of emotion- and response-specific findings to note. Contrary to prediction, collectivistic cultures were not associated with greater intensity of shame or guilt experiences, nor with any other aspect of emotional responding. In addition, long-term cultures were associated with lower subjective control on shame and guilt and lower nonverbal (but not verbal) expressions of these emotions. Clearly, these findings need to be reconciled in the future. Also, long-term orientation was negatively correlated with verbal and nonverbal expression and with ergotropic and trophotropic symptoms, but positively correlated with felt temperature. UA was associated with increased trophotropic symptoms for five emotions, but relatively unrelated to other aspects of emotional responding. Differential patterns of associations suggest differential emotion profile responding, and future studies need to examine the specific aspects of these profiles in more detail (more below).

The present findings provided evidence for universality in coherence among phenomenologically based emotion response systems. In the emotion literature, the notion of coherence generally refers to a specific pattern of relationships among emotion com-

[3] For the original Hofstede (2001) dimensions, there were 36 countries; if one uses ordinary least squares power analyses as a guideline, this provided a power of .41 to detect a .3 correlation. The other factor, the reliability of the slopes, was impossible to estimate for many slopes because the random effect was not significant, and in MRCM, determining the reliability of a coefficient requires estimating a random effect. It is entirely possible (and statistically appropriate) to model Level 2 differences in Level 1 coefficients for which no random effect was estimated. Such coefficients are described as nonrandomly varying—that is, fixed effects that are varying without an associated random effect. Therefore, in the present analyses, we were able to model cultural (Level 2) differences in within-country (Level 1) relationships, irrespective of whether a random effect was estimated for a coefficient representing a relationship.

ponents (appraisals, experience, expression, behaviors, and physiology) that is the same for the same discrete emotions across individuals but different for different emotions. For example, in Mauss et al. (2005), the experience of amusement was positively correlated with skin conductance, but the experience of sadness was negatively correlated. The specific pattern of relationships for each emotion is probably related to how each emotion prepares the organism to deal with environmental demands; anger prepares us to fight, whereas fear prepares us to flee. These different behavioral responses require different yet coordinated preparatory responses, which are integrated by emotion.

In this study, however, coherence could not be measured with such precision because participants responded to checklists and data were summed within and across categories. For example, the nonverbal behavior variable was the composite sum of laughing–smiling, crying–sobbing, other facial expression changes, screaming–yelling, other voice changes, and changes in gesturing. Thus, the relationships we observed referred to associations between amounts of general response system categories—for example, the amount of emotional experience and the amount of nonverbal behavior—but not the specific type of nonverbal behavior. For this reason, the correlations among the response systems were always in the same direction (with the exception of the relationships with subjective control), thus hiding potentially different relationships with specific aspects of each response system. This was unavoidable because of the nature of the data set available and because of the fact that single responses would be too unreliable to analyze. Future studies will need to explore the possibility that unique relationships among phenomenological response systems exist for specific types of responses within each system.

The coherence findings also highlight the difference between self-reports of verbal and nonverbal expression. Although these two types of expressive behaviors were related to each other, they functioned differently. Emotional experience and physiological sensations were more strongly related to nonverbal than verbal behavior, and this suggests that these responses are more closely linked together than with verbal behavior. This is probably related to the fact that experience, physiology, and nonverbal behaviors are linked to emotions phylogenetically, whereas verbal behavior is a more recent evolutionary product. Verbal expressions were more strongly related to subjective control than were nonverbal expression, suggesting that control efforts affect verbal behavior more directly than nonverbal behavior. This finding is also consistent with the view that verbal behaviors are more controllable than nonverbal behaviors when emotions are aroused (Ekman & Friesen, 1974; Tomkins, 1978) and with the fact that lower face behaviors are more controllable than upper face behaviors (Matsumoto & Lee, 1993).

The relationships among the emotion variables were not moderated by culture. These findings are noteworthy because they implicate the source of the coherence obtained in this study and the emotion-specific findings obtained previously using this same data set by Scherer and Wallbott (Scherer, 1997b; Scherer & Wallbott, 1994) and by others (Frijda et al., 1989; Roseman et al., 1994). As mentioned in the introduction, previous findings have been interpreted to have occurred because of discrete neurophysiological processes underlying emotions, and the phenomenological experience of emotion corresponded with these underlying processes. Rime et al. (1990), however, demonstrated that emotion-specific phenomenological responses could be produced by asking participants about how people typically experience emotion, suggesting that such responses are based on shared social knowledge or beliefs about emotion. Breugelmans et al. (2005) countered that discrete phenomenological responding occurred in two very rural cultures and suggested that such responding was probably not due exclusively to shared social beliefs about emotion because it occurred in such vastly different cultures. Our findings support this latest position because it is probably more difficult for social construction to affect relationships among variables than just mean levels. Coherence among the phenomenological response variables, therefore, is more likely due to an underlying actual coherence among emotion responses and not because of social construction.

Yet, our data do not entirely rule out the influence of construction. The relationships we observed, although consistent among the various response systems, were still relatively weak to moderate. This leaves much room for other processes to influence the response systems, including individual differences and social construction. A more appropriate interpretation of our data, therefore, suggests that the coherence we observed probably occurred because of an underlying neurophysiological basis of coherence among discrete emotions that leaves room for environmental influence.

This point is related to the finding that cultures appear to be related to differences in mean levels of the various responses, but not to the relationships (coherence) among them. Collectively, these findings put the universality–cultural relativism debate about emotions in a different light. More specifically, cultures may be associated with mean absolute levels of responding, especially in expressive behavior, because these tend to have social-communicative features and are thus more influenced by cultural norms. The variance decomposition findings, the relative lack of cultural influences on emotional experience, subjective control, and the relationships among the response systems suggest, however, that culture has much less influence on the structure and organization of emotions. This is probably related to the notion that cultures may exert relatively less influence on psychological processes that are more strongly influenced by underlying genetic factors and relatively more influence on those processes that are socially constructed (Poortinga, 1990). Emotions involve both genetically based, neurophysiological components as well as socially constructed ones (Mesquita & Frijda, 1992). Our data, which were self-reports of actual emotional experiences, may be more reflective of the former, thus resulting in less between-country–culture variability. It is entirely possible that other aspects of self-reported emotion, such as beliefs, attributions, and opinions, that constitute culturally based worldviews about emotions, are associated with larger cultural differences (Matsumoto, 2006). This might account for larger cultural differences obtained in studies from a constructivist viewpoint. Future studies examining the relationship between culture and emotion, therefore, may examine the relative degrees of cultural influences depending on the specific aspect of emotion examined.

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