2-2007

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Recommended Citation

Matsumoto, D., Nezlek, J. B., & Koopmann, B. (2007). Evidence for universality in phenomenological emotion response system coherence. Emotion, 7, 57-67.

http://dx.doi.org/10.1037/1528-3542.7.1.57

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Evidence for Universality in Phenomenological Emotion Response System Coherence

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Abstract

We reanalyzed data from Scherer and Wallbott's (Scherer, 1997a, 1997b; Scherer & Wallbott, 1994; Wallbott & Scherer, 1995) 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 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 vs. Short Term Orientation for numerous measures. Greater long term orientation was associated with lowered emotional expressivity and less physiological sensations. Third, at the individual (within-culture) level, across the seven emotions, there were consistent and reliable positive relationships between verbal and nonverbal expression and between verbal and nonverbal expression and physiological reactions, indicating coherence among the emotion response systems. And fourth, such relationships among the phenomenological variables were *not* moderated by cultural differences, as measured by the Hofstede dimensions.

Evidence for Universality in Phenomenological Emotion Response System Coherence

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 *et al.*, 1989; Scherer, 1997a, 1997b); expressive behavior and physiological sensations (Scherer & Wallbott, 1994); action readiness (Frijda et al., 1989), action tendencies, goals, and actions (Roseman *et al.*, 1994); and subjective experience (Roseman et al., 1994; Scherer & Wallbott, 1994). Collectively, they demonstrate that phenomenological experience can differentiate among discrete emotion states.

One important corollary to the idea that emotions are organized as discrete, qualitatively different states is the notion that the various components of emotion – appraisals, subjective experience, physiological responses, expressive behaviors, and action tendencies – are related to each other in a systematic fashion. In the literature, one way to characterize this notion has been the term *emotion response system coherence*. Such coherence, which would be evidenced by covariation among the components, is important to an understanding of emotions, and especially 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 between parents and children, romantic partners, or bosses and subordinates.

Previous studies have provided evidence for such coherence. The strongest evidence comes from several sources: studies reporting positive relationships between emotional experience and facial expressions of basic emotions when emotions were actually elicited (Ekman *et al.*, 1990; Ekman *et al.*, 1980; Ekman *et al.*, 1988; Gosselin *et al.*, 1995; Matsumoto & Kupperbusch, 2001; Mauss *et al.*, 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 *et al.*, 1993; Hess *et al.*, 1995; Keltner, 1995; Keltner & Bonanno, 1997; McGhee, 1977; Ruch, 1995; Smith, 1995); studies on the "facial feedback hypothesis," which suggests that facial expressions augment subjective emotional experience (Hess *et al.*, 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 et al., 1999). The research is not unequivocal, however; some studies have not found relationships between experience and expression, or only weak relationships (Fernandez-Dols & Ruiz-Belda, 1995; Fernandez-Dols & Ruiz-Belda, 1997; Kraut & Johnson, 1979; Ruiz-Belda *et al.*, 2003; Schneider & Josephs, 1991; Schneider & Unzner, 1992; Soussignan & Schaal, 1996).

Studies examining the relationship between experience and physiological reactions are less consistent. Early studies found relatively weak relationships (Mandler *et al.*, 1961; Weinstein *et al.*, 1968), but more recent studies have found somewhat stronger relationships (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). Nevertheless, these relationships tend to be only low to moderate in size (Brown & Schwartz, 1980; Lang *et al.*, 1993). Recently, Mauss et al. (2005) tested the coherence between experience, expression, and physiology by measuring them in second-by-second precision as participants watched amusing and sad films. They 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 significant *r*s = .19 - .52).

All of the studies cited in the previous two paragraphs examined emotions actually elicited in laboratory-controlled settings. Studies examining coherence among phenomenological aspects of emotion responding, however, are very rare. To our knowledge, only one report to date has examined such coherence. Frijda et al. (1989) conducted two studies in which they asked Dutch students to recall an instance where they experienced each of eight emotions. They rated each on multiple dimensions of appraisals and action readiness items. Regression analyses indicated that the appraisal ratings accounted for, on average, 19% and 24% of the action tendencies' variance in both studies, respectively.

Thus, while 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.

The Importance of Testing Emotion Response System Coherence across Cultures

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

Second, there is a large literature (Averill *et al.*, 2001; Ekman, 1992; Frijda et al., 1989; Izard, 1991; Scherer, 1997a; Scherer & Wallbott, 1994) suggesting that the emotional states studied to date are shared universally (although there are clear 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 emotion response system coherence exists, then such coherence should be found across individuals in different cultural contexts. We test that notion below by examining coherence within a large sample of respondents across a wide range of countries and cultures.

Third, emotion response system coherence may be moderated by culture, and uncovering if this is so is important theoretically because such findings can inform

questions concerning 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) can be interpreted as suggestive of either a correspondence with an underlying, discrete biophysiological basis for emotion, or socially-shared constructions about emotional experience. In fact Rime et al. (1990) demonstrated that unique physiological profiles reported when emotion is actually aroused could be generated by students asked to describe the stereotypic changes that occur when emotion is aroused, suggesting that self-reports of actual emotional experience could be 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 total constructivistic viewpoint.

An examination of the coherence among emotion response systems across cultures informs this debate because a total social-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 some 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 addresses these issues through a reanalysis of data previously published in Scherer and Wallbott's (Scherer, 1997a, 1997b; Scherer & Wallbott, 1994; Wallbott & Scherer, 1995) International Study of Emotion Antecedents and Reactions (ISEAR). In this project 2,921 participants in 37 countries across 5 continents completed a questionnaire about the antecedents of and their reactions to seven emotions (more detail below in Methods). 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. Our report, therefore, addresses important new questions on an existing data set that heretofore have not been addressed.

Additionally, 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 preparation). The accuracy of the parameter estimates is based largely in the fact that MRCM uses maximum likelihood procedures to estimate parameters, rather than traditional ordinary least squares approaches underlying ANOVA 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. Importantly for this report, the analyses can 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 his most recent publication, Hofstede (2001) reported data from 72 countries, and defined his dimensions in the following manner:

Individualism v. Collectivism: The degree to which cultures encourage people to look after themselves and their immediate family only, or encourage people to belong to ingroups 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 v. 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 v. Short Term Orientation: The degree to which cultures encourage delayed gratification of material, social, and emotional needs among its members.

Although other sources of country-level cultural data do exist, such as Schwartz's (Schwartz, 2004) value orientations or Bond et al's (Bond *et al.*, 2004) social axioms, we use Hofstede's 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-stroked base that can be used to understand cultural variability.

Goals and Hypotheses

Using the ISEAR data set and MRCM techniques, we addressed four goals: (1) to re-assess between- and within-culture variability in means regarding phenomenological emotional responding; (2) to examine the relationships between country-level differences in these means and the Hofstede cultural dimensions; (3) to examine within-culture relationships among the variables, to assess emotion response system coherence; and (4) to examine if the relationships obtained in (3) were moderated by culture.

Scherer and Wallbott (1994) had previously found only small to moderate country by emotion interactions on subjective experience, physiological sensations, and verbal and nonverbal behaviors, the same variables we examine here (çs ranging from .16 to

.24). For this reason we, too, expect that 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 v. Collectivism (Kitayama & Markus, 1994; Matsumoto & Ekman, 1989; Mesquita, 2001). On one hand, members of collectivistic cultures express (Ekman, 1972; Matsumoto & Kupperbusch, 2001), and believe they express (Pittam et al., 1995), basic emotions (i.e., anger, contempt, disgust, fear, happiness, sadness, and surprise) less than members of individualistic cultures. Members of collectivistic cultures also rate these same emotions expressions as less intense (Biehl et al., 1997; Matsumoto & Ekman, 1989), and experience them less intensely (Matsumoto et al., 1988; Scherer et al., 1988). On the other hand, members of collectivistic cultures have also been shown to experience self-conscious emotions such as shame and guilt more strongly than members of individualistic cultures (Kitayama *et al.*, 1995). Thus we hypothesize 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, finding a positive correlation between appraisals and action tendencies. 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, cultural differences in mean levels of emotional responding lead us to believe that culture also influences 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. 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; Scherer *et al.*, 1986; Wallbott & Scherer, 1986). Participants completed a two page questionnaire about seven emotions: anger, disgust, fear, happiness, sadness, shame, and guilt. The questionnaire consisted of four parts. In the first, participants described the situation that elicited the emotion. In the second, they described their subjective feelings by rating the duration, intensity, and impact of the event on relationships with other people. In the third, participants described their physiological symptoms, expressive reactions, and the degree to which they tried to control their

reactions. In the fourth, participants answered questions related to their appraisals of the situation.

The data from the second and third parts of the questionnaire were analyzed in this study. 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 8 verbal utterances; respondents checked all they experienced. We focused on verbal and nonverbal reactions. Verbal behavior was computed by summing each time participants selected silence, short utterance, one or two sentences, or lengthy utterance. These scores ranged from 0-3. Nonverbal behavior was computed by tallying each time respondents selected laughing/smiling, crying/sobbing, other facial expression change, screaming/yelling, other voice changes, and changes in gesturing. These scores ranged from 0-6. These scores were the same as those used in the Scherer and Wallbott (1994) report.

Physiological symptoms were measured with a checklist of 11 bodily symptoms; respondents checked all they experienced. The symptoms were grouped into three categories: Ergotropic Arousal, which included change in breathing, heart beating faster, muscles tensing/trembling, perspiring/moist hands (scores ranging from 0-4); Trophotropic Arousal, including lump in throat, stomach troubles, crying/sobbing (scores ranging 0-3); and Felt temperature, including feeling cold/shivering, feeling warm/pleasant, feeling hot/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.

Culture Data

The culture data came from Hofstede's (2001) database. There are data on the original four dimensions from 50 countries and 3 regions; data on Long Term Orientation (LTO) exist for 29 countries and 2 regions. Additionally, index score estimates for another 16 countries were available in Hofstede's (2001), and these were used for Bulgaria, China and Poland. Scores were standardized prior to analysis. For this report, we had data on 36 countries for the four original Hofstede dimensions, and 25 countries on LTO.

Analytic Strategy

The analyses were done using Hierarchical Linear Modeling (HLM) (Raudenbush *et al.*, 2000). HLM 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 included in these analyses, level 2 weights were used to reflect these differences. Weighting simply by raw population was not appropriate, however, because the differences in populations were too large. Raw population (in millions) was distributed with $M = 102.4$, $SD = 270.6$. For example, China and India had populations over 1.0 billion, whereas New Zealand had a population of approximately 4 million and Finland had 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 ($M = 1.32$, $SD = .69$); 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 Levels 1 or 2. These analyses estimated means and within- and between-country variances. The equations representing these analyses are below:

Level 1: $y_{ij} = \beta_{0j} + r_{ij}$.

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

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 most salient aspect of these data is that the vast majority (over 90% in all cases, over 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 Scores

We examined relationships between countries' scores on the Hofstede 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 v. Collectivism (IN), and Masculinity v. 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 v. Short Term Orientation (LT); 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 scores were included at Level 2, uncentered because they had been standardized prior to analysis. The Level 2 model was:

Level 2: $\beta_{0j} = \gamma_{00} + \gamma_{01}(UA) + \gamma_{02}(PD) + \gamma_{03}(IN) + \gamma_{04}(MA) + u_{0j}$.

Relationships between Hofstede 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 Long Term Orientation (LT) and nonverbal expressions (6 of 7 emotions), verbal expressions (four emotions significant or marginally significant), trophotropic symptoms (three emotions significant or marginally significant), ergotropic symptoms (6 of 7 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 Uncertainty Avoidance and trophotropic symptoms (5 of 7 emotions).

HLM estimates unstandardized coefficients, meaning that coefficients represent the change associated with a 1 unit change in a predictor. Hofstede scores were standardized prior to analysis; thus coefficients represent changes in dependent measures associated with a 1 *sd* change in Hofstede scores. For example, for nonverbal expression

of fear, LT had a coefficient of -.12. For every 1 unit increase in country scores on LT, mean nonverbal expression of fear decreased .12.

It was possible that the findings involving LT occurred because it was analyzed separately from the other culture dimensions. This was not the case, however. 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:

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

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

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; 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 of these analyses 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 for only anger and disgust. These coefficients were unstandardized; each represented how much a dependent measure changed for each 1 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 1 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 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 of seven emotions, and with felt temperature for six of seven emotions. Nonverbal expression was positively related to both trophotropic and ergotropic symptoms for all seven 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 expression 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 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 only four of seven 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 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 the first author).

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, under 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 status of the culture data. Limitations of Hofstede's culture dimensions, especially Individualism v. Collectivism, have been discussed recently (Bond et al., 2004; Oyserman *et al.*, 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-stroked 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 Affective Autonomy and Egalitarianism (Schwartz, 2004), and with country-level differences in Extraversion and Openness (Hofstede & McCrae, 2004). Thus it is very likely that even if other 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 statistical power. Unfortunately, power analyses for multilevel analyses are complex and not thoroughly understood at present. For our analyses, the ability to detect cultural differences in within-country relationships can probably be understood best in terms of two factors: the number of countries and the reliability of the within-country relationships (slopes in multilevel modeling). For the original Hofstede dimensions, there were 36 countries; if one uses OLS

power analyses as a guideline, 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 non-randomly varying – i.e., 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 or not a random effect was estimated for a coefficient representing a relationship. For this reason we cannot be certain if the present data set provided high power to detect cultural differences in within-country relationships.

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, imply that culture exerts a strong influence on emotions. Kitayama and Markus (1994), for instance, speculate 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. The data from this study, 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 orientations, compared to short-term, had less verbal and nonverbal expressions and physiological sensations. A typical interpretation of these findings would suggest that long-term 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.

But, long-term cultures also had lower means on several emotion intensity and subjective control variables, indicating that their members had somewhat less intense emotional experiences to begin with, and exerted less subjective control over their reactions. This suggests, therefore, that it is *not* that members of long-term cultures actively suppress their reactions, but that members of short-term 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 multiple extant sources. First, countries high on Hofstede's Long-Term Orientation tend to be negatively associated with country-level differences on Extraversion (McCrae, 2002), suggesting that members of short-term cultures may experience emotions more intensely. Second, emotional experiences figure more prominently in the lives of people from short-term oriented cultures (Suh *et al.*, 1998). Third studies of cultural differences in emotion judgments have indicated that members of short-term cultures exaggerate their ratings of the intensity of emotional expressions relative to judgments of actually felt emotions, but members of long-term cultures do not (Matsumoto et al., 1999). In short, members of long-term cultures may not

suppress their emotional responses; instead, members of short-term cultures may be more emotional.

That Long v. Short Term Orientation was related to many more aspects of emotional responding compared to Individualism v. Collectivism is an interesting finding. As mentioned above, many previous studies (Kitayama & Markus, 1994; Matsumoto & Ekman, 1989; Mesquita, 2001) have used the Individualism v. Collectivism framework to interpret cultural differences. The current findings suggest that a more important cultural dimension is Long v. 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 due to the field's preoccupation with Individualism v. 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. Additionally, long-term cultures were associated with lower subjective control on shame and guilt, and lower nonverbal (but not verbal) expressions on 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. Uncertainty Avoidance 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 may examine this possibility in more detail in the future (more below).

The present findings provided support for the notion of 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 components (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, while fear prepares us to flee. These different behavioral responses require different yet coordinated preparatory responses, which is 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 change, screaming/yelling, other voice changes, and changes in gesturing. Thus the relationships we observed referred to associations between *amounts* of general response system categories, e.g., 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 due to the nature of the data set available, and to the fact that single responses within computed variables would be too unreliable. Future studies, therefore, 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 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 rather recent evolutionary product. Verbal expressions were more strongly related to subjective control than 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 when emotions are aroused (Ekman & Friesen, 1974; Tomkins, 1978), and with the fact that lower face behaviors are more controllable than upper face (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 that 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, thus suggesting that such responses are based in 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, while 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 constructivist ones. 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 still leaves room for considerable 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 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, opinions, which constitute culturally-based worldviews about emotions, are associated with larger cultural differences (Matsumoto, in press). 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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We thank thank Guillermo Campos, Elena Martinez, Manveen Dhindsa, and Lupita Rodrigues for their assistance in our general laboratory program.

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Table 1
Descriptive Statistics for All Variables

	Verbal Expression				Nonverbal Expression			
Emotion	Intercept	Between	Within	% Within	Intercept	Between	Within	% Within
Joy	2.00	.08	.93	92	1.49	.03	.88	97
Fear	.73	.03	.79	96	.97	.05	.95	95
Anger	1.64	.09	1.20	93	1.37	.05	1.16	96
Sad	.76	.04	.95	96	1.29	.08	1.03	93
Disgust	1.07	.05	1.09	96	.93	.04	.79	95
Shame	.86	.02	.87	98	.94	.05	.86	95
Guilt	.91	.04	1.03	96	.81	.04	.88	96

	Emotional Intensity				Subjective Control			
Emotion	Intercept	Between	Within	% Within	Intercept	Between	Within	% Within
Joy	3.14	.01	.71	99	1.28	.01	.27	96
Fear	3.07	.04	.78	95	1.87	.03	.57	95
Anger	2.99	.02	.74	97	1.58	.01	.51	98
Sad	3.18	.02	.72	97	1.85	.03	.53	95
Disgust	2.68	.04	.88	96	1.67	.01	.55	98
Shame	2.59	.04	.88	96	2.25	.03	.52	95
Guilt	2.59	.03	.84	97	2.05	.02	.57	97

	Trophotropic Symptoms				Ergotropic Symptoms			
Emotion	Intercept	Between	Within	% Within	Intercept	Between	Within	% Within
Joy	.16	.01	.16	.94	.79	.05	1.00	.95
Fear	.49	.02	.43	.96	1.97	.12	1.65	.93
Anger	.33	.02	.31	.94	1.49	.10	1.49	.94
Sad	.71	.03	.43	.93	.89	.09	1.30	.94
Disgust	.43	.03	.34	.92	.77	.06	1.10	.95
Shame	.34	.01	.33	.97	1.02	.05	1.36	.96
Guilt	.41	.02	.37	.95	.79	.05	1.21	.96

	Felt Temperature			
Emotion	Intercept	Between	Within	% Within
Joy	.86	.02	.50	.96
Fear	-.05	.03	.88	.97
Anger	.60	.02	1.05	.98
Sad	-.03	.01	.56	.98
Disgust	.12	.03	.60	.95
Shame	.74	.12	1.10	.90
Guilt	.27	.05	.75	.94

Note: Columns labeled “Between” contain estimates of the between-country variance, columns labeled “Within” contain estimates of the within-country variance, and columns labeled “% Within” contain the percent of total variance that was within-countries.

Table 2
Relationships between Hofstede's Cultural Dimensions with All Variables

	Verbal Expression					Nonverbal Expression				
Emotion	PD	UA	IN	MA	LT	PD	UA	IN	MA	LT
Joy						-.14*				
Fear	-.08*				-.15**					-.12**
Anger					-.09a					-.11**
Sad					-.10**					-.13**
Disgust		-.08a			-.08a					-.07**
Shame							.08a			-.07**
Guilt										-.13**

	Emotional Intensity					Subjective Control				
Emotion	PD	UA	IN	MA	LT	PD	UA	IN	MA	LT
Joy					-.04*		-.04a			.02a
Fear					-.10**					-.07a
Anger										
Sad						.07a		.11*		
Disgust				-.06*						
Shame		-.09*				-.06*				-.13**
Guilt										-.09*

	Trophotropic Symptoms					Ergotropic Symptoms				
Emotion	PD	UA	IN	MA	LT	PD	UA	IN	MA	LT
Joy		.05**	.05**							-.09*
Fear		.08**	.05a		-.09**		.11**			-.17**
Anger		.05*			-.04a	-.18a				
Sad		.09**								-.17**
Disgust						-.15**				-.13**
Shame					-.06**	.10*				-.12**
Guilt		.09**			-.07**					-.16**

	Felt Temperature				
Emotion	PD	UA	IN	MA	LT
Joy				.05a	.05*
Fear			.13**		-.09**
Anger		-.08**			
Sad			-.05*		.05**
Disgust					
Shame				.10*	.17**
Guilt					.15*

Note: For all tables containing coefficients, coefficients with p >.10 were not tabled. PD = Power Distance; UA = Uncertainty Avoidance; IN = Individualism v. Collectivism; MA = Masculinity v. Femininity; LT = Long v. Short Term Orientation

* p < .05, ** p < .01, a .05 < p < .10

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

	Emotion Intensity and Expression		Verbal and Nonverbal Expression	Emotion Intensity and Physiology		
Emotion	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		
Emotion	Trophotropic Symptoms	Ergotropic Symptoms	Felt Temperature	Trophotropic Symptoms	Ergotropic Symptoms	Felt Temperature
Joy	-.13*		.07**	.22**	.28**	.22**
Fear		.04**	.04**	.26**	.22**	
Anger	-.07a	.14**	.10**	.33**	.33**	.10**
Sad		.08**	.09**	.31**	.30**	
Disgust		.10**	.10**	.21**	.32**	.07*
Shame		.04*	.03a	.23**	.26**	.11**
Guilt		.08**	.10**	.25**	.31**	.06a

	Subjective Control and Expression	
Emotion	Verbal	Nonverbal
Joy	-.37**	-.17**
Fear	-.14**	.06a
Anger	-.49**	-.15**
Sad	-.11**	
Disgust	-.39**	-.11**
Shame	-.20**	
Guilt	-.21**	-.07**

Note: * $p < .05$, ** $p < .01$, a $.05 < p < .10$

Footnotes

[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 preparation), and a detailed description of the error terms that were and were not estimated in the present analyses can be obtained from the second author. It should be noted that all intercepts in all analyses were modeled as random effects.