

## Body Sensations Associated With Emotions in Rarámuri Indians, Rural Javanese, and Three Student Samples

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Cultural variations in the associations of 12 body sensations with 7 emotions were studied in 2 rural samples from northern Mexico ( $n = 61$ ) and Java, Indonesia ( $n = 99$ ), with low exposure to Western influences and in 3 university student samples from Belgium ( $n = 75$ ), Indonesia ( $n = 85$ ), and Mexico ( $n = 123$ ). Both parametric and nonparametric analyses suggest that findings from previous studies with only student samples (K. R. Scherer & H. G. Wallbott, 1994) were generalizable to the 2 rural samples. Some notable cultural deviations from common profiles were also identified. Implications of the findings for explanations of body sensations experienced with emotions and the cross-cultural study of emotions are discussed.

*Keywords:* emotion, cross-cultural, culture, body sensations

People are said to be “red” with anger and to have “weak knees” during fear. Bodily metaphors are so common to emotion talk (see Kövecses, 2000) that many people will find it difficult to imagine emotions without any bodily sensation at all. Early scholars in psychology posited the experience of body sensations to be the defining component of emotional experience (e.g., James, 1884), but challenges to the physiological differentiation of emotions (Schachter & Singer, 1962; Valins, 1972) and the physiological origin of experienced body sensations (Rimé, Philippot, & Cisamolo, 1990) have led to a diminished importance of this component in contemporary emotion theory. Both the general

importance (e.g., Averill, 1974) and the specific characteristics (e.g., Ameka, 2002) of bodily metaphors of emotions have been argued to be culturally variable constructions rather than reflections of intrinsic physiological changes. So, in some cultures, people may be said to feel their intestines “boiling with anger” (Kövecses, 2000) and their liver “jumping with fright” (Lutz, 1988).

In the emotion literature, physiological activation and experienced body sensations are often taken as a single component (see Mesquita & Frijda, 1992), but the empirical evidence for emotion differentiation in each of these two domains is markedly divergent. Whereas the physiological differentiation of emotions is still debated (see Levenson, Ekman, & Friesen, 1990; Zajonc & McIntosh, 1992), experienced body sensations have been found to consistently differentiate between emotions across individuals and methods (for a review, see Rimé et al., 1990). This contrast may be due to difficulties in studying physiological concomitants of emotions (see Cacioppo & Tassinary, 1990; Stemmler, Heldmann, Pauls, & Scherer, 2001), but an alternative explanation is that experienced body sensations have a cognitive rather than a psychophysiological origin.

In a constructivist view (e.g., Averill, 1974; Hupka, Zaleski, Otto, Reidl, & Tarabrina, 1996), body sensations come about because they are expected to occur as part of emotion processes; they are part of cognitive schemata about physiological events associated with emotions (Philippot & Rimé, 1997). Rimé et al. (1990) found that schematic stereotypes about bodily concomitants

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of emotions closely matched the sensations typically reported to be felt during emotion episodes. A constructivist view is supported by reports of cultural variation in emotions and bodily concomitants (see Mesquita & Frijda, 1992) as well as anthropological accounts of culture-specific constellations of emotional experiences (e.g., Lutz, 1988). In the light of cultural variation in the use and meaning of emotion concepts (e.g., Ameka, 2002; Russell, 1991), substantial cross-cultural differences are expected in body sensations as concomitants of emotion processes.

Results from extensive culture-comparative studies, however, are incompatible with the notion that relationships between body sensations and emotions are only a matter of cultural construction. The differentiation of body sensations across emotions has been found to show strong similarities across cultures (e.g., Scherer, Summerfield, & Wallbott, 1983; Scherer & Wallbott, 1994; Scherer, Wallbott, & Summerfield, 1986), contrary to what would be expected if body sensations were culturally constructed phenomena. Although cross-cultural similarity does not provide direct evidence of links between body sensations and physiological events, it does suggest that body sensations are a universal and distinct emotion component. This means that the range of cultural variation in the conceptualization of body sensations with emotions is constrained by universal characteristics of the emotion process (see Kövecses, 2000; Poortinga, 1992).

In response, some constructivist scholars (e.g., Hupka et al., 1996; Rimé et al., 1990) have argued that previous cross-cultural studies may have underestimated cultural variation due to a number of methodological limitations. Philippot and Rimé (1997) suggested that differences may have been curtailed due to (a) the use of open-answer questionnaires, which may have led to a smaller number of body sensations being spontaneously thought of by participants than would have been the case had they been presented with a list of body sensations in closed-answer questionnaires; (b) the limitation of studies to mainly Western countries or student samples; and (c) the aggregation of body sensation items into broad categories. Philippot and Rimé (1997) argued that "before drawing any definite conclusion in this domain, noncollege students, and rural populations should be compared in markedly different cultures" (p. 184). There is evidence that inclusion of nonstudent samples from non-Western countries increases the cultural variation found in emotion studies (e.g., Russell, 1994; Van Hemert, Poortinga, & Van de Vijver, 2005).

The present study addresses the range of cultural variation in body sensations with emotions, incorporating the methodological extensions suggested by Philippot and Rimé (1997). The study included Rarámuri Indians, rural Javanese, and student samples from Belgium, Indonesia, and Mexico, extending the range of cultural variation to populations with very limited exposure to Western, industrialized lifestyles. Furthermore, we used closed-answer questionnaires with seven emotions and 12 body sensations, including sensations used in previous studies (Scherer & Wallbott, 1994) as well as some new sensations. These measures should increase the probability of finding more cultural variation in experienced body sensations with emotions, allowing for better estimation of the generalizability of the findings from previous studies on this topic.

In attempts to go beyond the universality-cultural-relativity dichotomy in emotion studies (see Manstead & Fischer, 2002), researchers have proposed viewing cross-cultural invariance and variations as a continuum, indicating the degree to which psycho-

logical phenomena can be generalized across cultures (Van de Vijver & Poortinga, 1982). However, estimates of the extent of cultural variation are complicated by the quasiexperimental design of culture-comparative studies and the possibility of bias (Poortinga & Malpass, 1986; Van de Vijver & Leung, 1997). This makes the interpretation of statistically significant differences as reflections of substantial cultural differences debatable (see Matsumoto, Grissom, & Dinnel, 2001). Hence, some cross-cultural studies of emotion (e.g., Scherer & Wallbott, 1994; Wallbott & Scherer, 1988) have primarily looked at estimates of effect size. This does not resolve any problems of bias, but it avoids capitalizing on relatively unimportant effects. For the mapping of the relationship between body sensations and emotions in various cultures, analyses at an ordinal level (e.g., Rimé & Giovanni, 1986; Rimé et al., 1990) can be useful because sources of bias related to general score levels (e.g., response styles or general differences in reported emotion intensity) are avoided. In the present study, analyses at both interval and ordinal levels of measurement were performed. In summary, in the present study, we (a) examine the extent of cross-cultural variations in body sensations associated with emotions among samples from highly divergent cultures, (b) map differences between emotions in characteristic body sensation profiles, and (c) identify cultural deviations from common profiles.

## Method

### *Participants*

Five samples were included in this study: urban student samples from universities in Belgium, Indonesia, and Mexico and rural samples with little or no formal education from villages in Central Java (Indonesia) and Northern Mexico. Of the 450 participants in the study, 7 with more than 2.50% missing values were excluded from further analysis. For the other participants, missing values (in total 0.09% of the scores) were replaced by the item mean of the sample. In total, 443 participants were included in the analyses.

The Belgian student sample consisted of 75 undergraduate students (41 female, 34 male) from the Université catholique de Louvain, Louvain-la-Neuve, Belgium, with a mean age of 20.31 years ( $SD = 1.93$ ). Virtually all participants were native French speakers originating from French-speaking Belgium (Wallone). The Indonesian student sample consisted of 85 undergraduate students (60 female, 25 male) from Universitas Indonesia in Jakarta, with a mean age of 20.29 years ( $SD = 3.50$ ). All participants were fluent speakers of Bahasa Indonesia, Indonesia's national language, and with few exceptions, they originated from western Java. The Mexican student sample consisted of 123 undergraduate students (83 female, 40 male) from the Escuela Libre de Psicología A.C. in Chihuahua with a mean age of 24.46 years ( $SD = 8.20$ ). All participants were native Spanish speakers originating from the northern states of Mexico or, in a few cases, from central Mexico.

The Mexican rural sample consisted of 61 Rarámuri (Tarahumara) Indians (24 female, 37 male) with a mean age of 51.70 years ( $SD = 14.57$ ), as indicated by the participants themselves. All were native speakers of (at least one of) the Rarámuri variants and had received little or no formal education. All participants resided in or traveled around the community of Guachochi in the central highlands of the Sierra Tarahumara. The Rarámuri are a native Indian group of Uto-Nahua or Uto-Aztec descent, living in the Sierra Madre mountains in the Mexican state of Chihuahua. They form the largest indigenous group in northern Mexico, with an estimated population of between 60,000 and 80,000. Traditionally, individual families live dispersed over the available land, and no substantial agglomerations of indigenous households are found. Subsistence is mainly through small-scale agriculture, with cultivation of crops such as maize and beans.

Historically, the Rarámuri are known for their strong resistance to Spanish and, later, Mexican cultural influences (see Levi, 1998). Western media have been brought to Rarámuri territory, but most of the population still has very little contact with these. For the purposes of this study, participants who spoke little or no Spanish were selected to minimize the influence of Mestizo cultural diffusion.

The Indonesian rural sample consisted of 99 Javanese farmers (49 male, 50 female) with a mean age of 46.18 years ( $SD = 14.63$ ). All were native speakers of Javanese, living in various small farming communities in the central south region of Java. Although the tropical climate and fertile volcanic soil may yield three or even four harvests of rice each year, most farmers are poor due to low crop prices and limited land ownership. For this study, we selected traditional communities in which manual agricultural labor was the most common source of income, buildings were constructed mainly of wood and bamboo, and a sewerage system, tap water, and sometimes even electricity were absent. Eighty-seven percent of the participants had not finished rural primary school, and exposure to Western media was very limited.

### Instrument

The instrument consisted of seven emotion vignettes (joy, anger, fear, sadness, disgust, surprise, and shame), each accompanied by a list of 12 body sensations (lump in the throat, breathing changes, stomach sensations, feeling cold, feeling warm, feeling hot, heart beats faster, sweating, goose-flesh, blushing, weak in the knees, and hot in the eye).<sup>1</sup> An emotion was identified both by an emotion word (e.g., *joy*) and by a vignette giving an example of a situation in which the emotion might typically be experienced (e.g., "What do you feel in your body when you experience joy, for example, when a good friend has come to visit you?"). The example was added to reduce effects of possible semantic differences in emotion words. Because some of the situations used appeared to be less applicable with the Rarámuri, the vignettes were extended with an additional example (e.g., "What do you feel in your body when you experience joy, for example, when a good friend has come to visit you or when you are at a very nice party?"). This was done for additional clarification, to reduce possible translation bias of the emotion words. Rarámuri is not a written language, and interviewers needed to adapt the specific items to the variant spoken by individual interviewees. In a prestudy with the Mexican students, the extended vignettes were found to elicit the same emotions as the original vignettes. Hence, we decided to use the extended vignettes in the Spanish version of the instrument, which was the basis of the Rarámuri version.

The list of body sensations was based on a list originally developed by Wallbott and Scherer (1988) and adapted by Philippot (1991). A sensation reported in a pilot study with Indonesian participants (i.e., *hot in the eye*) and a sensation spontaneously reported in both Belgium and Indonesia (i.e., *goose-flesh*) were added to Philippot's questionnaire. The item *tense muscles* was removed because no translation into Rarámuri could be found without a major connotation of physical illness. Each item had a 6-point Likert scale ranging from *I do not feel this body sensation at all* (0) to *I feel this body sensation very strongly* (5). Scores indicated the intensity with which participants reported experiencing a body sensation with an emotion.

For each of the translations into Bahasa Indonesia, Spanish, and Javanese, several local bilinguals were involved, using a committee approach (Van de Vijver & Leung, 1997). Translation into Rarámuri was done by two bilinguals, using a back-translation method. Cross-checking was done in field interviews by S.M.B. The translation procedures were also used to assess the understandability of our items in the cultural context and of any specific cultural meanings that the items might entail. All seven emotions and 12 body sensations were well understood in all samples.

### Procedure

Participants were asked to take part in a study concerning sensations that people feel in their bodies during emotions. Belgian students were ap-

proached in different libraries on the university campus and asked to complete the questionnaire under supervision of one of the researchers. Indonesian and Mexican students completed the questionnaire during a lecture period. All students participated voluntarily and were not paid.

Rural Javanese and Rarámuri were approached in their communities by trained local interviewers. The Indonesian interviewers were undergraduate students from Sanata Dharma University in Yogyakarta with experience in interviewing. The interviewers were fluent in Javanese and originated from the area where the interviews were administered. After an initial training, trial interviews were held, followed by evaluation by the researchers. Participants were interviewed individually in their homes or on their farmlands. Participation was voluntary, and each participant was paid 12,500 Indonesian rupiah (by local standards, a generous reward for the time spent). The Rarámuri interviewer originated from the Guachochi area and was fluent in the local variations of the Rarámuri language. He had experience interviewing local inhabitants for several governmental institutions and was trained and tested in several trial interviews for the present study. Participants were interviewed in their homes, on their lands, or on the road while traveling. They cooperated voluntarily and were not paid individually because this would not have been appropriate by local standards. Instead, maize was bought and given to the local community for a celebration.

## Results

### Extent of Cross-Cultural Variation

The extent of cross-cultural variation in the data was examined using a multivariate variance components analysis, with the factors culture (5), emotion (7), body sensation (12), and their interactions in addition to the factor individual (443). The model explained 47% of the variance, with individuals (11%) and the Emotion  $\times$  Body Sensation interaction (12%) explaining more than the Emotion  $\times$  Culture interaction (2%) or the Culture  $\times$  Emotion  $\times$  Body Sensation interaction (5%). Thus, individual consistency and differentiation of body sensations across emotions were more important in explaining the variance in our data than were interaction components involving emotion and culture. The remaining effects were relatively small as well. Overall differences in general intensity level were as follows: between cultures (2%), emotions (2%) and body sensations (7%). The Body Sensation  $\times$  Culture interaction (4%) suggested relatively small differences between cultures in the average intensity of body sensations across emotions.

Separate repeated measures analyses (see Appendix A) with culture (5) as a between-subjects factor and emotion (7) as a within-subjects factor, also suggested substantial cross-cultural similarity for each separate body sensation.<sup>2</sup> Table 1 displays the estimated effect sizes (partial  $\eta^2$ 's) of the main effects and interactions for each body sensation. The extent of cross-cultural variation in the data is best examined by comparison of the multivariate main effect of emotion and the Emotion  $\times$  Culture interaction (e.g., Scherer & Wallbott, 1994). Main effects and interactions were significant in all instances, but the mean effect size of the interactions across body sensations (mean  $\eta^2 = .14$ ,  $SD = .04$ ) was markedly lower than the mean size of the main effects of

<sup>1</sup> Translations of emotion words, body sensations, and emotion vignettes in each of the five target languages are available on request from Seger M. Breugelmans.

<sup>2</sup> Preliminary analyses including gender as a between-subjects factor yielded nonsignificant or small ( $\eta^2$ 's  $< .05$ ) effects and interactions. This factor was not included in further analyses.

Table 1  
Effect Sizes (Partial  $\eta^2$ 's) for Repeated Measures Analyses of Body Sensation With Culture (5) as a Between-Subjects Factor and Emotion (7) as a Within-Subjects Factor

Factor	Body sensation											
	Lump in the throat	Breathing changes	Stomach sensations	Feeling cold	Feeling warm	Feeling hot	Heart beats faster	Sweating	Goose-flesh	Blushing	Weak in the knees	Hot in the eye
Culture (C)	.34	.22	.38	.13	.13	.21	.20	.11	.24	.24	.12	.14
Emotion (E)	.58	.49	.52	.46	.76	.68	.77	.56	.45	.68	.54	.43
C × E	.13	.12	.10	.19	.11	.12	.17	.12	.16	.15	.22	.11

Note. All effects are significant ( $ps < .001$ ).

emotion (mean  $\eta^2 = .56$ ,  $SD = .12$ ). The largest cultural differences in differentiation of body sensations across emotions were found for *weak in the knees* and *feeling cold*, but even for these, the main effects of emotion ( $\eta^2 = .54$  and  $\eta^2 = .46$ , respectively) were much larger than the interactions ( $\eta^2 = .22$  and  $\eta^2 = .19$ , respectively).

Because of the substantial age differences among our samples, we also performed repeated measures analyses with age as a covariate. With 9 body sensations, the covariate did not reach significance. In addition, the effect sizes of the Emotion × Culture interactions were only marginally lower for any body sensation (mean  $\eta^2$  difference =  $-.02$ ; maximal  $\eta^2$  difference =  $-.04$ ) when age was introduced as a covariate. Hence, it seemed unlikely that the cultural variation in the association of body sensations with emotions could be accounted for by the differences in age between the samples.

Our results are similar to those obtained by Scherer and Wallbott (1994), who analyzed aggregated body sensations of student samples from 37 countries. They concluded that such results indicated pronounced emotional differentiation of body sensations, showing substantial cross-cultural similarities. In this context, univariate main effects for culture are difficult to interpret because they may signify differences between cultures in the general intensity with which body sensations are experienced across emotions but may also reflect differences in scale use, for example due to response tendencies (Van de Vijver & Leung, 1997; Van Herk, 2000).

### Body Sensation Profiles Across Emotions

We explored emotion-specific profiles of body sensations by examining the rank order of mean intensity ratings of body sensations for each emotion in each culture (see Rimé et al., 1990). Examination at the ordinal level facilitates the search for emotion specificity of body sensations across cultures, because possible biases related to general score level (e.g., response styles) and emotions (e.g., differences in overall intensity between emotion words) are avoided. The rank orders of body sensations in Table 2 were computed by averaging the emotion-specific rank orders of all five samples (see Appendix B). Unfortunately, there are no clear criteria in the literature for when to consider a body sensation “typical” for an emotion. Somewhat arbitrarily, we have taken the top 25% (i.e., an average rank order  $\leq 3$ ) of body sensations to be primarily associated with each emotion, whereas the others are deemed less typical. Table 2 also indicates, in superscripts, the most salient cultural deviations from the average rank order. These deviations give a first impression of emotion-specific association of body sensations and of possible influences of culture.

The profiles in Table 2 suggest that emotions are associated with different body sensations. Every emotion except *anger* and *surprise* is associated with at least one sensation that is not primarily associated with other emotions. However, some body sensations are highly associated with several emotions (e.g., *heart beats faster* and *breathing changes*). To estimate the degree of distinctness of body sensation profiles for the various emotions, we calculated rank order correlations (Spearman's  $\rho$ s) between body sensation profiles. These showed that, generally, correlations between emotions were low (median  $\rho = .36$ ). The profile of *surprise* (median  $\rho = .56$ , ranging from  $-.07$  to  $.81$ ) was least distinct from that of other emotions, and the profile of *disgust* (median  $\rho = .04$ , ranging

Table 2  
Average Rank Order Profiles of Body Sensations Associated With Emotions

		Emotion						
		Anger	Fear	Sadness	Disgust	Surprise	Shame	
Joy	Feeling warm							
	Heart beats faster	Heart beats faster	Heart beats faster	Lump in the throat <sup>-4</sup>	Stomach sensations	Heart beats faster	Heart beats faster	
	Breathing changes	Breathing changes	Breathing changes	Feeling cold	Breathing changes	Breathing changes	Feeling hot	
	Feeling hot	Feeling hot	Weak in the knees	Breathing changes	Goose-flesh <sup>-4</sup>	Feeling hot <sup>-5</sup>	Blushing <sup>-4</sup>	
	Feeling hot <sup>+2,+3</sup>	Lump in the throat <sup>+1</sup>	Feeling cold <sup>+4,+5</sup>	Heart beats faster <sup>+4,+3</sup>	Feeling cold <sup>+2,+3</sup>	Sweating	Sweating	
	Blushing	Blushing	Sweating	Heart beats faster <sup>+1,+5</sup>	Heart beats faster <sup>+4</sup>	Weak in the knees <sup>+4</sup>	Feeling cold <sup>+5</sup>	
	Sweating	Sweating	Stomach sensations <sup>+2,+3</sup>	Hot in the eye <sup>+3</sup>	Lump in the throat <sup>+5</sup>	Blushing	Weak in the knees <sup>+4</sup>	
	Stomach sensations	Stomach sensations <sup>+3</sup>	Goose-flesh <sup>+5</sup>	Stomach sensations <sup>+2,+3</sup>	Weak in the knees	Feeling warm <sup>+1</sup>	Breathing changes	
	Weak in the knees <sup>+4</sup>	Hot in the eye	Lump in the throat	Sweating	Stomach sensations <sup>+3</sup>	Stomach sensations <sup>+3</sup>	Lump in the throat	
	Feeling cold	Weak in the knees <sup>+4</sup>	Feeling hot	Hot in the eye	Hot in the eye	Lump in the throat	Stomach sensations	
	Lump in the throat	Feeling cold	Hot in the eye	Feeling hot <sup>+4</sup>	Feeling hot	Feeling cold	Hot in the eye	
	Hot in the eye	Goose-flesh	Blushing	Goose-flesh	Blushing	Goose-flesh <sup>+5</sup>	Goose-flesh	
	Goose-flesh	Feeling warm	Feeling warm	Feeling warm	Feeling warm	Hot in the eye	Feeling warm	

Note. A superscript *minus* sign indicates that a primary body sensation (displayed above the dashed line) belonged to the bottom 50% (i.e., had a cultural rank order >6) in a particular culture; a superscript *plus* sign indicates that a nonprimary body sensation (displayed below the dashed line) belonged to the top 25% (i.e., had cultural rank order ≤3) in a particular culture. 1 = Indonesian students; 2 = Belgian students; 3 = Mexican students; 4 = Rarámuri Indians; 5 = rural Javanese.

from  $-.30$  to  $.69$ ) was most distinct. The fact that the profiles of some emotions were related should not be surprising given the documented similarities between emotions on other dimensions of affect (see Russell, Lewicka, & Niit, 1989). However, for the purposes of our study, the profiles seemed sufficiently distinct to consider each of the seven emotions as separate.

Cultural Deviations

For the generalizability of the findings and the interpretation of cultural deviations in our study, it is important to know to what extent our findings are similar to Scherer and Wallbott's (1994) findings with students from 37 countries. For a comparison, we calculated rank orders on the basis of the percentages of body sensations reported by Scherer and Wallbott (1994, Table 8, p. 321). Only the body sensations (*lump in the throat*, *breathing changes*, *stomach sensations*, *feeling cold*, *feeling warm*, *feeling hot*, *heart beats faster*, and *sweating*) and emotions (*joy*, *anger*, *fear*, *sadness*, *disgust*, and *shame*) shared by both studies were included. The resulting rank order correlations were all very high and significant ( $N = 8$ ,  $ps < .05$ ), ranging from .99 for *anger* to .95 for *fear*, .91 for *sadness*, .90 for *joy*, .83 for *shame*, and .74 for *disgust*. Correlations of the average rank orders of only the rural samples with Scherer and Wallbott's results were lower, but still significant ( $N = 8$ ,  $ps < .05$ ), ranging from .92 for *anger* to .83 for *fear* and for *joy*, .81 for *sadness*, .60 for *disgust*, and .59 for *shame*. This strongly suggests that the common emotion profiles found in our study show generalizability across studies and samples, providing a firm basis for the identification of cultural deviations.

The unequal distribution of salient deviations in Table 2 suggested that some emotions show more cross-cultural variation and that some samples are less similar to the average patterns than are others. We calculated rank order correlations for each culture with the average association pattern. Table 3 confirms the impression that the convergence between cultures across emotions is substantial; the correlations were generally high. Three exceptions were the lower congruence of the Rarámuri for *anger* ( $\rho = .55$ ) and for *sadness* ( $\rho = .57$ ) and of the Javanese for *surprise* ( $\rho = .37$ ). These two samples also showed a slightly lower mean congruence across emotions. This suggests that Philippot and Rimé's (1997) assertion that the inclusion of non-Western, nonstudent samples increases cultural variation is valid. However, considering the likelihood of bias effects (e.g., in translation, test administration, interviewers), the similarities remain notable. The mean correlations in Table 3 can be seen as indexes of the generalizability of the body sensation profiles displayed in Table 2. This means that on the basis of the samples in our study, the pattern of *fear* (mean  $\rho = .90$ ) tends to be more culturally stable than that of, for example, *surprise* (mean  $\rho = .68$ ).

The design of our study did not allow for clear tests as to whether the specific deviations in body sensation profiles in Table 2 should be seen as bias (i.e., method artifacts) or as valid, culture-specific patterns; hence, any interpretation requires caution. Inspection of the culture-specific rank orders of body sensations (see Appendix B) suggests some salient deviations across emotions, whereas other body sensations are emotion specific. This has implications for the interpretation of our findings, as

Table 3  
Correlations (Spearman's  $\rho$ s) by Emotion of Cultural Rank Orders With the Average Rank Order of Body Sensations ( $N = 12$ ) in Table 2

Emotion	Students			Nonstudents		Mean $\rho$
	Indonesian	Belgian	Mexican	Rarámuri	Javanese	
Joy	.79**	.95**	.87**	.67*	.87**	.83
Anger	.86**	.98**	.93**	.55	.96**	.86
Fear	.98**	.90**	.94**	.82**	.86**	.90
Sadness	.92**	.76**	.71**	.57	.82**	.76
Disgust	.94**	.92**	.89**	.60*	.92**	.85
Surprise	.67*	.91**	.70*	.74**	.37	.68
Shame	.94**	.86**	.85**	.80**	.84**	.86
Mean $\rho$	.87	.90	.84	.68	.81	

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

illustrated by the following examples of highly deviant items.<sup>3</sup> First, the positive deviation of *weak in the knees* with the Rarámuri for *joy*, *anger*, *surprise*, and *shame* seemed to be the result of a general emphasis or prominence of this body sensation across emotions. Cultural salience of *weak in the knees* is plausible given the traditional life context and cultural focus on the condition of the legs in Rarámuri culture. Running and long-distance stamina are traditionally highly valued among the Rarámuri, who are renowned for their ability in long-distance racing (sometimes running more than 100 km cross-country; e.g., Bennett & Zingg, 1935; Kennedy, 1978).

Second, the negative deviation of *lump in the throat* with the Rarámuri for *sadness* is much more difficult to interpret in cultural terms. Inspection of the culture-specific rank order of this body sensation shows that *lump in the throat* scored low on all emotions, even those on which other cultures scored higher (e.g., *sadness*, *disgust*). This may mean that the body sensation is absent, or at least not elaborated on, in Rarámuri culture (cultural hypocognizing; Levy, 1984), but it is also possible that the translation of the item into Rarámuri was not equivalent.

Third, the positive deviation of *goose-flesh* with the rural Javanese for *fear* and *surprise* is likely to be the result of a culture-specific association. Translation inequivalence or other method artifacts are unlikely explanations; the rural Javanese use of *goose-flesh* with other emotions, and the use of other body sensations with *fear* and *surprise*, corresponded to the association patterns found for the other samples. The typical experience of goose-flesh (*merinding*) in traditional Javanese culture when seeing a ghost or spirit—an experience also strongly associated with fear and startlement—can provide a plausible account.

## Discussion

The main aim of the present study was to examine the extent of cross-cultural variation in body sensations associated with emotions when non-Western, nonstudent samples are included in culture-comparative research. Contrary to what would be expected if body sensations were a socially constructed emotion component, both parametric and nonparametric analyses pointed to substantial cross-cultural similarities in the data. Replication of the results of Scherer and Walcott's (1994) study with two rural samples from opposite sides of the globe suggests cross-cultural generalizability of a core of body sensation profiles with emotions.

The rural samples contributed more to cultural variation than did the student samples, although this effect was limited (see also Van Hemert et al., 2005). This supports the need for the inclusion of such samples to improve the validity of cross-cultural studies (Hupka et al., 1996; Philippot & Rimé, 1997). On the basis of our study, it is difficult to pinpoint what caused the cultural differences to be larger with the rural samples. There may be substantive explanations (i.e., cultural meanings of body sensations, such as *weak in the knees* or *goose-flesh*), but there are also several potential sources of bias (e.g., the selection of body sensations, interviewer effects, social desirability) that cannot be ruled out. In the absence of established theories regarding cross-cultural differences in body sensations associated with emotions, we tried to maximize the probability of finding cross-cultural differences in the present study by including both student samples from three continents and rural, nonstudent samples (see Russell, 1994; Van Hemert et al., 2005). However, most body sensations and emotions were selected from previous studies that showed substantial cross-cultural similarities. It is possible that studies including more specific body sensations with cultural samples that differ in their bodily images of emotions may find larger cross-cultural differences. Also, studies may find cross-cultural differences in the extent to which people use descriptions of body sensations to express their emotions (Ots, 1990). However, in our view, it is highly unlikely that the core of body sensation profiles found in our study and in Scherer and Wallbott (1994) would not be replicated in such studies. Overall, it can be concluded that the methodological improvements suggested by Philippot and Rimé (1997) increased cultural variation but that body sensation profiles with emotions still showed high generalizability across cultures.

Emotion theory has seen a gradual decrease in the emphasis on bodily aspects of affective experience, from James's (1884) peripheral emotion theory to the emphasis of cognitive determinants of experienced arousal in emotions (e.g., Valins, 1972). Like those of previous studies on body sensations (e.g., Rimé & Giovanni,

<sup>3</sup> Highly deviant items were identified by the difference (absolute) between the culture-specific rank and the average rank, averaged across emotions. *Weak in the knees* with the Rarámuri was the most deviant body sensation across cultures ( $M = 4.03$ ), *lump in the throat* with the Rarámuri was the second most deviant ( $M = 3.33$ ), and *goose-flesh* with the Javanese was the fifth most deviant ( $M = 1.97$ ).

1986; Scherer et al., 1983; Scherer & Wallbott, 1994), our results indicate that such sensations are associated with emotions in a similar way across cultures, strongly suggesting that body sensations are an important component of emotional experience. However, there were also differences between emotions in the differentiation of body sensation patterns and in the cross-cultural generalizability of these patterns. Joy, anger, fear, disgust, and shame appear to be better differentiated by body sensations across cultures than are sadness and, especially, surprise. For some emotions, body sensations may be a more important emotion component than for others. However, our results suggest that body sensations are equally important to contemporary emotion theory as are more established emotion components, such as appraisals, facial expressions, and action tendencies (Mesquita & Frijda, 1992).

The finding of substantial cross-cultural similarities limits explanations regarding the origin of experienced body sensations to psychological functions that are themselves cross-culturally similar. Although the present study did not address the mechanisms underlying bodily experiences of emotions, the most parsimonious candidate appears to be emotion physiology (see Scherer, 1992). Still, ambiguous findings in physiological differentiation of emotions (e.g., Boiten, 1996; Levenson et al., 1990; Zajonc & McIntosh, 1992) and self-perception of physiological processes (see Rimé et al., 1990) make this explanation imprecise and, hence, problematic. The alternative explanation of cognitive construction of bodily concomitants of emotions (see Philippot & Rimé, 1997) cannot be ruled out, but it would mean that such construction occurs in a very similar way across cultures, which is implausible.

For cross-cultural psychology, body sensations provide not only an accessible entry point for the comparison of affective experience across cultures (LeVine, 1973) but also an illustration of the need to simultaneously consider cultural invariance and cultural variation in studying psychological phenomena. Many contemporary cross-cultural studies seem to take the position that differences between groups are culturally meaningful unless these have been proven to be artifacts (Matsumoto et al., 2001). We argue that a combined culture-specific and culture-comparative approach, identifying cultural specificity with reference to a common standard, leads to a more precise assessment of cultural differences (Fontaine, Poortinga, Setiadi, & Markam, 2002). Rather than focusing on the universality–relativity dichotomy (see Manstead & Fischer, 2002), we propose that cultural differences should be seen as variations within the boundaries imposed by universal psychological processes (Poortinga & Soudijn, 2002). The strictness of these boundaries can vary across emotions, depending on the importance of body sensations in its differentiation from other emotions.

In our study, the correlations of cultural profiles with the average profile (see Table 3) reflect an estimate of the range of cultural variation. The tentative interpretation of salient cultural deviations from this pattern (see Table 2) shows how one can begin to make sense of such variation. Estimation of the range of variation is an empirical question and is likely to become more refined when specific cultural deviations are identified as bias or as culturally meaningful specificities. The culturally shared body sensation profiles may lead to the identification of more culture-specific deviations in future studies. Conversely, the investigation of cultural deviations in emotions—for example, *surprise* with the Javanese or *anger* with the Rarámuri—may lead to more accurate

estimates of cross-cultural generalizability of body sensation profiles. As such, detailed studies of culture-specific body sensations with emotions (e.g., Ameka, 2002) are complementary to global studies of the range of cultural variations in broad bodily categories (e.g., Scherer & Wallbott, 1994) with emotions, because both answer a different part of the same question.

In conclusion, there seems to be truth in James's (1884) claim of a central place for body sensations in shaping emotional experience. People from cultures around the world report embodied feelings of emotions. Although their exact feelings may vary, this variation is bounded by universal aspects of emotional experience; there are limits to the cultural definition of emotion. *Anger* will always be a "hotter" emotion than *fear*, whether this is felt in blood rushing to the head or in intestines boiling.

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Appendix A

Effects of Culture and Emotion in Repeated Measures Analyses of 12 Body Sensations

Body sensation	Between subjects		Within subject			
	Culture		Emotion		Emotion × Culture	
	MSE <sup>a</sup>	F <sup>b</sup>	Wilks's Λ	F <sup>c</sup>	Wilks's Λ	F <sup>d</sup>
Lump in the throat	4.89	57.27	0.42	98.78	0.55	11.67
Breathing changes	4.70	30.94	0.51	70.27	0.57	10.87
Stomach sensations	5.95	67.01	0.48	79.55	0.65	8.21
Feeling cold	4.44	16.39	0.54	62.38	0.42	17.57
Feeling warm	1.77	16.23	0.24	223.28	0.62	9.33
Feeling hot	4.04	28.71	0.32	152.32	0.60	10.18
Heart beats faster	4.92	27.13	0.24	235.48	0.47	15.17
Sweating	5.87	13.84	0.44	90.76	0.61	9.59
Goose-flesh	4.27	34.12	0.56	57.80	0.51	13.50
Blushing	4.38	34.87	0.32	152.42	0.52	12.95
Weak in the knees	5.46	15.17	0.46	84.20	0.38	20.11
Hot in the eye	4.77	17.95	0.57	53.96	0.63	9.03

Note. All effects are significant (*ps* < .001).

<sup>a</sup> Error *df* = 438. <sup>b</sup> *df* = 4. <sup>c</sup> Hypothesis *df* = 6; error *df* = 433. <sup>d</sup> Hypothesis *df* = 24; error *df* = 1,511.77.

(Appendix continues)

## Appendix B

Rank Orders of Body Sensations by Emotion for the Five Samples

Body sensation	Students		Nonstudents			Body sensation	Students		Nonstudents		
	Indonesian	Mexican	Belgian	Rarámuri	Javanese		Indonesian	Mexican	Belgian	Rarámuri	Javanese
Joy						Sadness ( <i>continued</i> )					
Lump in the throat	5	8	10	10	12	Heart beats faster	6	6	6	1	3
Breathing changes	3	5	5	6	2	Sweating	8	8	7	6	8
Stomach sensations	9	6	4	11	7	Goose-flesh	9	7	11	10	11
Feeling cold	11	10	11	4	9	Blushing	11	10	12	11	9
Feeling warm	1	2	2	1	1	Weak in the knees	3	4	9	7	1
Feeling hot	6	3	3	5	5	Hot in the eye	4	11	2	5	6
Heart beats faster	2	1	1	2	3	Disgust					
Sweating	7	7	7	7	4	Lump in the throat	4	4	6	11	2
Goose-flesh	10	12	8	12	10	Breathing changes	1	5	4	3	4
Blushing	4	4	6	8	6	Stomach sensations	2	1	1	1	1
Weak in the knees	12	9	9	3	11	Feeling cold	7	3	2	6	5
Hot in the eye	8	11	12	9	8	Feeling warm	12	12	12	12	12
Anger						Feeling hot	11	10	10	5	10
Lump in the throat	3	4	5	9	5	Heart beats faster	5	6	5	2	6
Breathing changes	2	2	2	3	3	Sweating	8	8	8	8	8
Stomach sensations	9	7	3	8	7	Goose-flesh	3	2	3	9	3
Feeling cold	6	9	10	5	9	Blushing	10	9	9	10	11
Feeling warm	12	12	12	12	12	Weak in the knees	6	7	11	4	7
Feeling hot	4	3	4	4	2	Hot in the eye	9	11	7	7	9
Heart beats faster	1	1	1	1	1	Surprise					
Sweating	8	6	6	6	8	Lump in the throat	4	9	7	11	7
Goose-flesh	11	11	11	11	11	Breathing changes	3	2	2	3	2
Blushing	7	5	7	10	4	Stomach sensations	8	7	3	9	8
Weak in the knees	10	8	8	2	10	Feeling cold	11	12	9	4	4
Hot in the eye	5	10	9	7	6	Feeling warm	2	4	11	7	10
Fear						Feeling hot	6	3	5	5	9
Lump in the throat	7	6	8	9	8	Heart beats faster	1	1	1	1	1
Breathing changes	2	2	2	5	4	Sweating	9	6	6	6	5
Stomach sensations	8	3	3	7	7	Goose-flesh	12	10	8	12	3
Feeling cold	4	7	6	3	3	Blushing	5	5	4	8	11
Feeling warm	12	12	12	12	12	Weak in the knees	7	8	10	2	6
Feeling hot	9	9	9	4	9	Hot in the eye	10	11	12	10	12
Heart beats faster	1	1	1	1	1	Shame					
Sweating	5	4	4	6	5	Lump in the throat	5	4	7	10	8
Goose-flesh	6	8	7	10	2	Breathing changes	7	6	6	6	9
Blushing	11	10	11	11	11	Stomach sensations	10	7	5	9	6
Weak in the knees	3	5	5	2	6	Feeling cold	8	9	9	4	2
Hot in the eye	10	11	10	8	10	Feeling warm	12	12	12	12	12
Sadness						Feeling hot	3	3	3	3	3
Lump in the throat	1	1	1	8	5	Heart beats faster	1	2	2	1	1
Breathing changes	2	5	4	4	4	Sweating	4	5	4	5	4
Stomach sensations	7	2	3	9	10	Goose-flesh	11	10	10	11	11
Feeling cold	5	3	5	3	2	Blushing	2	1	1	7	5
Feeling warm	12	12	8	12	12	Weak in the knees	6	8	8	2	10
Feeling hot	10	9	10	2	7	Hot in the eye	9	11	11	8	7

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