

Critiquing Models of Emotions

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This article provides the first systematic empirical examination of four major genres of theories concerning the nature and rise of the corpus of human emotions with more than 2,000 statistical tests of five hypotheses. The distinction between evolutionary-universal and other “secondary” emotions is empirically uninformative for all five cultures. Next, the emotion-wheel theory of Plutchik receives no empirical support. All palette theories fail four empirical tests. More than 90 empirical tests fail to support Kemper and Turner in assuming that many secondary emotions arise through complex combinations of primary emotions due to socialization. The Johnson-Laird and Oatley hypothesis of five universal clusters of emotions is also tested and rejected. Researchers need to rethink the heuristic value of dichotomizing and lumping emotions in categories such as universal, primary, basic, secondary, tertiary, and so forth. There are clear empirical advantages to differentiating between emotions with three dimensions rather than two dimensions.

Keywords: *emotions; primary; secondary; cross-cultural*

Scientific theories of emotions are so numerous that it is convenient to lump them into three classifications: determinist (mostly nonsociological), social constructionist, and social interactionist. The oldest category of theories is determinist and may be traced to Darwin’s (1896) concept of universal ancestral purpose, which is now seen as engineered through genetics. In essence, Darwin conceived of emotional expressions as universal responses that were tied to evolutionary vestiges of the facial

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expressions of animals. A modern exemplar of this type of theoretical tradition can be found in more than a third of a century of work by Ekman (1971) and Ekman and Rosenberg (1997) on universal facial expressions.

Biological theories expand the study of this deterministic and individualistic view of emotions through using physiological measures (e.g., cardiovascular and autonomic indicators) of bodily sensations assumed to be involuntarily associated with basic emotions such as anger and disgust (Levenson 1992). Although the role of genetics or the sympathetic nervous system underlying the physiological or cognitive component of emotions cannot be denied, deterministic theories often confuse physiological sensations with the feeling component of emotions. This is largely because these theories typically assume, without empirical support, that emotions operate independently of cognitive processes. Again, a small subset of emotions labeled *basic*, *primary*, or *universal* are typically studied while ignoring the larger set of unaccounted *secondary* or *tertiary* emotions.

Deterministic theories treat emotions as involuntary responses that occur during social interaction. By contrast, the two main types of sociological theories—social interactionism and social constructionism—assume that emotions may be voluntary and social structure may cause emotional responses. All three types of theories generally acknowledge that feelings happen to us and emotions happen during interaction.

However, social interactionists have amassed evidence that our interactions with others may make emotions happen, we then appraise the appropriateness or inappropriateness of those emotions, and these processes cause further emoting. The social interactionist view is well summarized by Kemper (1991), who asserts that other persons and their actions, rather than their objective (physical) state, instigate emotions. This viewpoint suggests that emotions aid in the maintenance and alteration of social relationships (Kemper 1978).

Social constructionists forward a third major approach. They object sharply to deterministic assumptions that emotions are irrational or uncivilized outbursts of feelings. Emotions are seen as having a cognitive component that promotes intelligent conduct. Emotions are used to influence others by projection of who we claim to be. Accordingly, the constructionist view posits a large class of human emotions that results from real, anticipated, imagined, or recollected outcomes of social relationships (Hochschild 1979; Thoits 1990; Lively and Heise 2004).

It is still common, however, for social interactionists and constructionists to invoke universal-nonuniversal, primary-secondary-tertiary, or

basic-nonbasic distinctions nonskeptically. No researcher appears to have attempted to test empirically the utility of distinguishing between a small core set of evolutionarily universal human emotions and other emotions.

Less clear still is the relationship of the much larger set of postulated secondary or tertiary emotions to the so-called core set. Unfortunately, there has been a proliferation of theories without attempts to empirically sort out and test competing explanations. This article provides the first systematic empirical examination of a few of these major proposals concerning the nature and rise of all emotions pan-culturally. We test five hypotheses that claim to explain how human emotions arose. We use data based on comparable emotion words collected independently and successively from Americans, Canadians, Germans, Japanese, and Taiwanese to make empirical sense out of the present overabundance of theoretical claims. We flesh out plausible and implausible assumptions underlying several theoretical genres of emotion theories.

Conceptualizing Emotions

What is an emotion? At the radical extreme, Kemper allows such a broad definition of emotions that in his own words, the “number is limitless” (1987:263).¹ Emotion words become simply new social labels for the individual’s personal experience of new social situations. Logically, this cannot be true if emotions are truly intersubjective. Emotions must include a manageable number of utilitarian signals for communicating and simplifying complex personal experiences in order to be intersubjective.

This article follows the lead of Clore, Ortony, and Foss (1987) in limiting tests of emotions to affective words that describe internal, mental feeling states. Major theorists continue to include terms that do not meet this strict standard. For example, the following words are representative of concepts that continue to be confused with true emotions: assertion, aversion, and seething (Turner 1999a); vengeance and snobbery (Kemper 1987); drowsy and sleepy (Russell 1980); and acceptance, anticipation, curiosity, cynicism, fatalism, and prudishness (Plutchik 2002). And Turner and Stets (2005) would add sympathy to the list.

Primary Emotions

As with the definition of emotions, there are great variations in the number of emotions that scholars consider to be evolutionarily universal.

At the low end is Sroufe (1979), who asserts 3 (pleasure, fear, and anger). Izard (1994) claims the other end of the spectrum with 11 (enjoyment, fear, anger, contempt, surprise, disgust, shame, shyness, distress, guilt, and interest). Part of the confusion is definitional—shyness and interest, for example, do not satisfy the Clore et al. (1987) definition of emotion.

Lewis (2000) suggests that happiness, sadness, disgust, anger, fear, and surprise arise as natural, internal, mental processes by the time infants reach 6 months of life. More self-conscious emotions such as embarrassment and envy appear about the second year of a child's life. As children gain a sense of selfhood around age 3, the emotions of pride, shame, and guilt seem to arise out of the ability to compare their behavior self-consciously against external standards.

If emotional expression is universal, it should evidence itself through the evolution of human neurology. Thus, following Darwin (1896), some students of emotions have made neurological comparisons across species. Such universal emotions must show evidence of being innately hardwired into the brain, rather than learned. Perhaps the most impressive research program in this tradition is that of Ekman (1971; Ekman and Rosenberg 1997). He and his associates have built a substantial body of empirical evidence supporting seven primary emotions meeting the Clore et al. (1987) definition for which there are universal facial expressions (anger, contempt, disgust, fear, happiness, sadness, and surprise). In essence, Ekman (1971; Ekman and Rosenberg 1997) argues that these are universal emotions because they are experienced as emotions beyond an individual's control. Acceptance of these indicators of neurological hardwiring under the strict Clore et al. (1987) definition of an emotion seems the most reasonable method presently for deciding which emotions are likely candidates for universal or primary status.

As one reviewer correctly points out, Ekman et al. (1987) provide strong empirical support for the cultural universality of display and recognition of a small number of emotions through facial recognition. The sociological dimensions of evaluation, potency, and activity (EPA) refer implicitly to social interactions, whereas facial expressions are self-contained. Since Ekman's (1971) universal emotions are less complex than those emotions constructed through social interaction, these universal emotions do not depend on the penumbra of meanings of emotion words. We accept and fully support these assumptions and stress that it is our concern to investigate the empirical support or lack of support of models that try to define and explain the breadth of meanings of emotion words.

Additionally, many emotion words do not have adequate translations across cultures (Smith and Ike 2003), so candidates must be words that pass translation/back-translation equivalence standards across cultures. This is true of all of the words we chose for the five-culture analyses. By these standards, it is clear that there is widespread agreement among cross-cultural specialists in emotions of at least four universal emotions passing these strict tests: happiness, fear, anger, and sadness.

Secondary Emotions

From past studies we surmise that the number of universal, primary emotions likely ranges between 5 and 10. So how many other human emotions exist? English has a relatively large number of emotion words compared to most modern languages. Clore et al. (1987) identified 234 English words that empirically meet their definitional standard. Many of these words are functional substitutes for each other; for example, there are many English concepts within the anger family that are cognitively difficult to distinguish.

Roughly 100 English emotion words from the list by Clore and his colleagues (1987) encompass nearly the entire domain of affective meanings (Morgan and Heise 1988; MacKinnon and Keating 1989), once we discount cognitive equivalents for emotions such as anger. Thus, it is unlikely that the actual number of distinguishable human emotions can be much greater than 100. Furthermore, since roughly 90 percent of these 100 English emotion words successfully passed the translation/back-translation requirement into German, Japanese, and Mandarin, our list of 99 emotions appears highly distinguishable.

Theoretical Organization of Emotions

Differentiating Primary and Secondary Emotions

Truly universal emotions are presumably biologically hardwired into human neurology while secondary emotions appear to be influenced more by socialization, self-consciousness, and cultural standards (Lewis 2000), so reliable and valid affective measures of universal emotions should show much less measurement variation within and across cultures than is true of secondary ones.² We are using not the similarity of EPA ratings that establish the criterion of universality but the lack of variation indicated by raters. Thus, our first hypothesis is as follows:

Hypothesis 1: Cross-cultural and within-culture variations in standard deviations and means for affective measurements should be significantly smaller for universal, primary, or basic emotions than more complex secondary emotions.

We do not adopt the premise that all raters have the same interpretations of emotions within a culture. Within-culture variances are not all the same. We test for the hypothesis that within-culture variances are smaller for primary versus secondary emotions. Homogeneity is a relative matter: Within-concept variance is tiny relative to variance between different concepts, but it is still meaningful for analysis of affectual meaning data (Kroska 2003).

A second test of the validity of the differentiation between primary and secondary emotions eliminates potential tendencies in the measurement of affective meaning to overestimate the cultural homogeneity in ratings on a dimension of meaning. This test of the biologically hardwired hypotheses is to compute cross-cultural tests of similarity in connotative meanings of EPA. If the universal-primary-basic distinction is correct, these tests of connotative similarity should support Hypothesis 2.

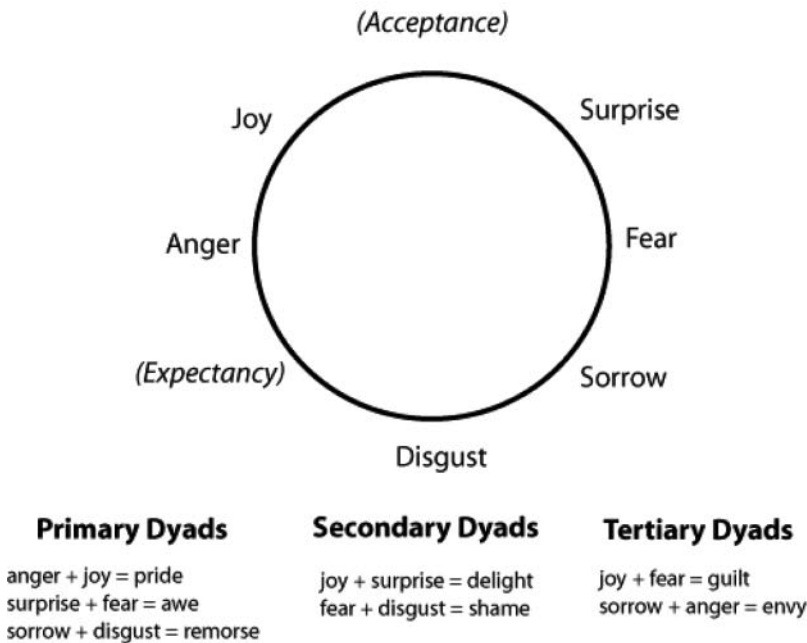
Hypothesis 2: Euclidean distances among cultures should be significantly smaller for ratings of EPA for so-called universal, primary, or basic emotions than for the remaining secondary or tertiary emotions.

Palette Theories

Major theories on how such a large number of complex emotions might have arisen emanate from analogies to the ways one can create an infinite number of secondary “colors” from permutations from the primary set. Plutchik (1962, 1980, 2002) proposes an emotion wheel starting with a set of eight universal emotions—clockwise from 12 o’clock in the order of acceptance, surprise, fear, sorrow, disgust, expectancy, anger, and joy.³ Affective ratings for such universal emotions should show much less within-culture and cross-cultural variation than nonuniversally labeled ones under Hypotheses 1 and 2. However, many of the words in Plutchik’s model are no longer accepted as emotions, so this article focuses only on the few passing the Clore et al. (1987) test. Figure 1 modifies Plutchik’s color wheel model to reflect the modern definition of Ortony, Clore, and Collins (1988).

The null hypothesis, of course, is that there should be no differences in Euclidean distances as measures of similarity of connotative meanings

Figure 1
Plutchik's (1962, 1980, 2002) Model of Emotions



Note: Nonemotions are shown in parentheses in italics surrounding the wheel. The original Plutchikian model has seven or eight dyadic combinations per dyadic type. The figure includes only those cases for which Plutchik's examples agree with the Ortony, Clore, and Collins (1988) definition of an emotion.

cross-culturally. Hypothesis 3 suggests a number of subhypotheses based directly on Plutchik's (1962, 1980, 2002) dyadic blending theory.

Hypothesis 3a: Emotions at 180 degrees from each other on the Plutchikian emotion wheel (fear-anger and sorrow-joy⁴) should show the most dissimilarity (e.g., the least intersubjectivity) in affective ratings across all three dimensions, regardless of culture.

Complex emotions arise in the Plutchikian model according to the following rules. Primary emotions arise additively from adjoining universal emotions on his emotion wheel.⁵ This means that the most similar emotions

should be acceptance-surprise, surprise-fear, fear-sorrow, sorrow-disgust, disgust-expectancy, expectancy-anger, anger-joy, and joy-acceptance. Secondary emotions are complex functions of once-removed neighbors (e.g., awe = surprise + fear). Tertiary emotions are complex functions of twice-removed neighbors (e.g., surprise-sorrow). The following three Plutchikian hypotheses are empirically testable with the affective-meaning ratings data sets.

Hypothesis 3b: Mixtures of the following designated dyads of primary emotions produce the following secondary emotions: pride = anger + joy, awe = surprise + fear, and remorse = sorrow + disgust.

Hypothesis 3c: Mixtures of the following designated dyads of primary emotions produce the following secondary emotions: disappointment = surprise + sorrow and shame = fear + disgust.

Hypothesis 3d: Mixtures of the following designated dyads of primary emotions produce the following tertiary emotions: outrage = anger + surprise and envy = sorrow + anger.

Socialization Theories

Socialization theories have also been evoked to explain how secondary emotions arise from a small subset of universal emotions. Most notable are the theories of Kemper (1987) and Turner (1999a, 1999b). This article starts from the same analytic logic as used with Plutchik (1962, 1980, 2002) to test the assumptions of Kemper and Turner that some secondary emotions are palette mixtures of universally learned associations.

First, we use Hypotheses 1 and 2 to test the assumptions of the universality of what they label as primary emotions. For Kemper (1987), primary emotions include fear, anger, depression, and happiness (satisfaction). Turner's (1999a, 1999b) list includes satisfaction-happiness, fear, anger, and disappointment-sadness. If they are correct, statistical tests should show much smaller standard deviations and similar means across and within cultures for the designated primary versus secondary emotions. Statistical tests should also show larger Euclidean distances for nonprimary than for primary emotions.

Kemper (1978) further assumes that some complex emotions are learned through associations with primary ones. For example, a child might learn to associate pride with the happiness her parents feel when she does well in school. From Kemper's work, we form Hypothesis 4a.

Hypothesis 4a: Affective ratings should be similar (e.g., have low Euclidean distances for affective-meaning ratings) for shame and anger, and for pride and happiness, because they are associated through learning.

Furthermore, Kemper, like Plutchik (1962, 1980, 2002), suggests that some secondary emotions are complex combinations of specific primary emotions. We use Euclidean-squared differences in ratings to operationalize hypotheses testing in both cases. Smaller Euclidean-squared differences imply more psychologically associated stimuli. Kemper's hypothesis may be formalized as follows:

Hypothesis 4b: Combinations of fear and depression lead to anxiety, jealousy, or envy; fear and happiness to awe; and anger and happiness to contempt.

Turner (1999a, 1999b) follows in the footsteps of both Plutchik (1962, 1980, 2002) and Kemper (1978) in assuming that secondary emotions arise out of permutations of primary emotions. Still, he views the formative process as much more complex than either of them. We have simplified his use of words to delineate emotions that conform to the definition of Clore et al. (1987) as he has many more predictions of what produces specific actions and trait attributions than secondary emotions. Thus, we limit his four primary emotions to the purer terms of happiness, fear, anger, and sadness. If his thesis of the first-order elaborations of primary emotions is correct, the following hypothesis ought to hold:

Hypothesis 4c: The following first-order combinations should produce specific secondary emotions (depending on the mix): happiness + fear produces pride or awe; happiness + anger produces calmness, envy, or jealousy; happiness + sadness produces melancholy; anger + sadness produces bitterness, depression, envy, dissatisfaction, or discontentment; and sadness + fear produces remorse.

Basic Modes or Families Assumption

The mixture approaches discussed predict the rise of only a fraction of secondary emotions if they truly are hybrids of a small set of universal, primary emotions. Johnson-Laird and Oatley (1989) suggest a more heuristically rich means of accounting for all true emotions. They advocate five of the hypothesized universal emotions of Ekman (happiness, sadness, fear, anger, and disgust) as "basic modes" on the assumption that no emotion state can be reduced to anything more semantically fundamental.

They argue that these five modes have two communicative functions. Internally, these modes function to allow the brain to bypass complex inferences. Externally, these modes permit members of a species a manageable set of minimum signals for communicating without the need for conscious awareness of their causes.

Ortony and Clore (1989) admit that this novel theory is important and explicitly falsifiable, but they are skeptical of two critical assumptions: that (a) these five emotions are semantically basic and (b) the criterion of unconscious awareness of causes (operationalized by "I feel X [basic emotion] but I don't know why.") is necessary. They suggest that the theory needs cross-cultural tests. We provide the first cross-cultural test of the semantic universality of their five basic emotional modes under the more relaxed assumption that each basic emotion represents families of related emotions that emerge as empirical clusters (Schneider 1999; Schneider and Roberts 2004). We conduct this test for emotion words common to all five cultures.

Hypothesis 5: Cluster analysis will show that emotion words naturally sort into five emotion clusters corresponding roughly with happiness, sadness, fear, anger, and disgust, regardless of culture or subculture (operationalized by sex of raters).

Method

Morgan and Heise's (1988) lexicon of 99 emotion words inspired a Canadian English (MacKinnon and Keating 1989) replication as well as comparable lexicons of nearly 100 emotion words for German (Schneider 1990),⁶ Japanese (Smith and Ike 2002), and Mandarin (Smith and Luo 2003). Lexical mean EPA ratings may be viewed online through the Affect Control Theory home page (Heise 2000a). Morgan and Heise, in turn, built their lexical representation of the domain of emotions to fit the strict definition of emotion we have already given, after consultation with Clore, Ortony, and their colleagues. Cultural lexicons of emotion words in the affect control theory library use similar collection and sampling procedures to aid in ruling out plausible alternative explanations for differences in findings.

For each of the five cultures, we attempted to translate all 99 of the American English emotion words from Morgan and Heise (1988). The Canadian lexicon includes exactly 99 connotative American equivalents. Eleven of these original emotion words do not translate or back-translate adequately in Japanese (delighted, heartbroken, heavyhearted, impatient,

mad, scared, self-pitying, shook-up, sick at heart, uneasy, and upset). In total, the Japanese lexicon includes 88 emotion words. Six of the 99 North American English emotion words have no translatable counterparts in Mandarin, for a total of 93 emotion word stimuli. Those 6 untranslatable emotion words include irritated, lonesome, scared, sick at heart, thrilled, and touched.

The poorest coverage is from the German dictionary—but not because of translation difficulties. Thirty-three emotion words from the original Morgan-Heise (1988) list are missing from coverage; 66 are covered. The missing emotion words may be found in Table 1.

Computerized Questionnaire

The five affective data collection instruments are publicly available on the World Wide Web.⁷ The stimuli always appeared in the indigenous language equivalent of “(substituted emotion word) feels.” The Java-based Surveyor program (Heise 2000b) randomly introduces order of presentation of stimuli, scales, and dimensions for each of the three affective dimensions. Surveyor also randomly displays the bipolar ends of each scale on the computer screen in each instance as safeguards against effects of response sets of stimuli ordering, dimensional presentation, and scale orientation.

We use the dimensions and bipolar scales derived from the original indigenous psychometric studies of the semantic differential for Japanese and Chinese (Osgood, May, and Miron 1975). German was not among those indigenous psychometric studies of Osgood et al. (1975). The German scales were informed through unpublished material of Charles Osgood. Surveyor provides for nine labeled checking positions on each scale. For each language, we found equivalents to *neutral* = 0, *slightly* = 1, *quite* = 2, *extremely* = 3, and *infinitely* = 4.3 for each of the three EPA scales and all five cultures. Surveyor discriminates among 430 different scalar points from 4.3 to -4.3 on each dimension rated.

Cultural Informants

Each test uses a minimum of 30 female and 30 male informants. These were students who participated in a computerized questionnaire for extra credit or for small material incentives. Although we use small convenience samples in each case, there is strong evidence that we do not require large random samples because we are not interested in population differences but

Table 1
Emotion Words Used in Five-Culture Tests of Hypotheses

English/Canadian	German	Japanese	Taiwanese
Afraid	X		
Aggravated			
Agitated			
Amused			
Angry			
Anguished			
Annoyed			
Anxious			
Apprehensive	X		
Ashamed			
At ease	X		
Awestruck	X		
Bitter			
Blue			
Brokenhearted			
Calm			
Charmed			
Cheered			
Cheerless			
Content			
Crushed	X		
Deflated	X		
Dejected			
Delighted		X	
Depressed			
Disappointed			
Discontented			
Disgusted			
Displeased			
Dissatisfied			
Distressed	X		
Downhearted	X		
Ecstatic			
Elated			
Embarrassed			
Empty			
Excited			
Envious 1			
Envious 2			
Fearful	X		
Fed up	X		

(continued)

Table 1 (continued)

English/Canadian	German	Japanese	Taiwanese
Flustered	X		
Frightened	X		
Frustrated			
Furious			
Glad			
Grief stricken			
Happy			
Heartbroken	X	X	
Heavyhearted		X	
Homesick			
Horrificed			
Hurt			
Ill at ease			
Impatient		X	
In love			
Irate	X		
Irked			
Irritated	X		X
Jealous			
Joyful	X		
Joyless	X		
Lonely	X		
Lonesome			X
Lovesick	X		
Low	X		
Mad		X	
Melancholy			
Miserable			
Mortified	X		
Moved			
Nervous			
Outraged			
Overjoyed			
Overwhelmed	X		
Passionate			
Petrified	X		
Pleased			
Proud			
Regretful			
Relieved			
Remorseful			
Resentful			
Sad			

(continued)

Table 1 (continued)

English/Canadian	German	Japanese	Taiwanese
Satisfied	X		
Scared		X	X
Self-pitying		X	
Shaken	X		
Shook-up	X	X	
Sick at heart	X	X	X
Sickened	X		
Sorry	X		
Sorrowful			
Stunned	X		
Terrified	X		
Thrilled			X
Tormented	X		
Touched	X		X
Uneasy		X	
Unhappy			
Upset	X	X	

highly intersubjective cultural differences. Romney, Weller, and Batchelder (1986) demonstrate that when measuring highly intersubjective cultural knowledge, it is sufficient to use convenience samples of less than 30 cultural informants (Romney et al. 1986). This is, of course, different from investigating population differences that require large random samples.

Herman Smith ran test–retest correlations between the EPA profiles of 79 emotion words common to the 2002 Japanese data set and an earlier 1990 data collection effort to test the Romney et al. (1986) assumption. The original 1990 data used 30 men and 31 women who were undergraduate students of the senior author at Doshisha University in Kyoto, Japan, to rate 99 emotion words using traditional paper-and-pencil methods. Despite the intervention of 12 years and different convenience samples (1990 ratings derive from a private university in Kyoto vs. the 2002 data that we drew from private and public university students in the Tokyo and Sendai areas) the EPA test–correlations for men are .93, .92, and .93; for women, the comparable correlations are .95, .92, and .91.⁸ This gives strong evidence that our Japanese data are part of a corpus of highly intersubjective cultural knowledge. Still, it is important to understand that affectual-meaning data produce sufficient homogeneity relative to interconcept variance that we can bypass large-scale sample surveys (Kroska 2003).

Table 2
Average Standard Deviations (Standard Errors) of Evaluation, Potency, and Activity Ratings by Culture and Gender

	American	Canadian	German	Japanese	Mandarin
<i>N</i>	99	99	66	105	102
Male evaluation	1.99	1.08	1.22	1.68	1.87
Male potency	1.59	1.31	1.75	1.77	1.89
Male activity	1.38	1.33	1.65	1.07	1.48
Female evaluation	2.36	1.11	1.25	1.36	1.48
Female potency	1.92	1.50	1.96	1.51	1.37
Female activity	1.67	1.44	1.68	1.41	1.20

As further evidence, we produced standard deviations for all five cultures. Standard deviations in Table 2 for the five cultures are smallest for Canadian and Mandarin emotion words, depending on the EPA dimensions. The largest standard deviations are found for Americans, but this is likely an artifact of smaller *N*s. All standard deviations show high intersubjectivity.

Analysis

We use Levene's test for equality of variances and *t* tests for equality of mean standard deviations to scrutinize within-culture variations for tests of Hypothesis 1. That is, we compared partial standard deviations for pooled universal versus other emotions words. The results are univocal in rejecting Hypothesis 1. None of the Japanese tests indicates statistically significant differences separating 8 designated universal and 91 other emotion words for either sex on any of the three dimensions. Five (EPA female and P and A male) of six similar Taiwanese tests fail to show statistical significance. Only the Taiwanese male evaluation tests for equality of variances reach statistical significance ($p > .02$), but that test is in the predicted direction. Finally, none of the American, Canadian, or German tests indicate statistically significant differences in standard deviations for universal versus other emotion words. In summary, only 1 in 30 (5 cultures $\times$ 2 sexes $\times$ 3 dimensions) statistical tests reaches a statistically significant threshold.

Next, we computed all 20 (2 sexes $\times$ 10 five-culture combinations) Euclidean distance measures of affective closeness for each of the 99

emotion words to test Hypothesis 2.⁹ Smaller distances imply higher intersubjectivity across subcultures (sexes) and cultures. This procedure produces 1,598 usable Euclidean distances with a range of 99 (Canadian-American) to 66 (German-Canadian) cases of paired comparisons. Of these, 8.5 percent (132) were designated as universal emotion word tests based on our earlier operationalizations. Only 103 Euclidean distances (6 percent) are outliers. Thirty-two emotion words account for the least intersubjectivity, with the following 5 making up 33 percent of the outlier Euclidean distances, so we recommend that they not be used in future cross-cultural studies (anxious, resentful, ecstatic, excited, and irked). Hierarchical cluster analysis confirms these recommendations.

The mean Euclidean distance for cultural pairs of the 8 universal emotions is 3.23 while the mean for the other 91 emotion words is 3.26. Standard deviations are 3.52 and 3.57, respectively; hence, the difference is statistically nonsignificant. Also, this lack of support for higher intersubjectivity cross-culturally for universal over nonuniversal emotion words is underscored by the fact that precisely half of the means for universal emotion words are larger than for nonuniversal emotion words, providing no evidence in support of Hypothesis 2.

We also rank ordered Euclidean distances for each of the 20 cross-cultural pairs and then compared the rank orders to test Hypothesis 2. The range of smallest distances (a crude measure of highest intersubjectivity) suggests nothing particularly more intersubjective about the so-called universal emotions: Roughly 80 percent of the remaining emotion words have smaller Euclidean distances than the largest squared difference (and close to 10 percent more than the smallest squared difference) among the eight designated universal emotions over the 20 ranked-order tests. The evidence again overwhelming indicates that Hypothesis 2 should be rejected. Universal and secondary emotions are not distinguishable by variation in their cross-cultural intersubjectivity as measured by the EPA dimensions.

We then tested Plutchik's (1962, 1980, 2002) palette model with several subhypotheses. Hypothesis 3a suggests that fear-anger and sorrow-joy comparisons should show the most dissimilarity in affective ratings. None of 30 comparisons (5 cultures $\times$ 2 sexes of raters $\times$ 3 dimensions) indicate any support for this hypothesis. In most comparisons, the pairs are not even in the top or bottom 10 in dissimilarity of affective ratings.

Next, we used simple regression analysis to test Plutchik's (1962, 1980, 2002) palette predictions from Hypotheses 3b and 3c. His model is presented as a gestalt, so rejection of any portion of the model throws suspicion on his entire conception. Also, his model is based entirely on the

positive-negative dimension, so we limit our appraisal to evaluation ratings. Predicted palette effects of Hypotheses 3b and 3c are easy to reject with one simple regression: $Pride = 2.3 - 0.18joy (+0anger)$, with an r^2 of .67 using a four-culture test. Notice that anger has no statistical effect on pride in this regression equation as implied by the Plutchikian palette theory. That is, to support his theory, the regression equation should show a clearly additive effect close to $pride = 0.5joy + 0.5anger$.

Kemper (1987) offers a somewhat weaker set of palette assumptions, summarized in testable form in Hypothesis 3d. Hypothesis 3d assumes that some emotions become affectively associated through learning. By Kemper's logic, shame and anger, and pride and happiness, ought to have similar affective ratings. We compare Euclidean distances as direct tests of this assumption. Our results do not support Kemper's contention in large part because P and A ratings are often polar opposites *within* each culture—a clear sign that the emotions are not psychologically similar. Also, this adds to the evidence that the third dimension, potency, is necessary to accurately describe emotions.

For example, the range of Euclidean distances within each culture for the shame-anger pair are larger than required for our earlier cross-culture tests of intersubjectivity in Hypothesis 1, with a low of 8.3 for Taiwanese women to a high of 29.6 for German women. This implies that shame and anger are not semantically associated in any of our five cultures, as Kemper (1987) posits; consequently, we cannot support Hypothesis 3a.¹⁰ We used the same logic of prediction through regression analysis to test parts of Hypothesis 3b. According to Kemper, combinations of anger and happiness should lead to feeling contempt. Similar to our test of Plutchik's (1962, 1980, 2002) belief in the causes of pride, regression indicates that the evaluation of contempt is purely a function of anger, with no empirical influence of happiness indicated, although his theory implies a regression equation of the form $contempt = 0.5anger + 0.5happiness$.

Hypothesis 4 also includes a number of testable palette and socialization assumptions. To test Hypothesis 4a, one Euclidean distance comparison is enough to throw doubt on Kemper's (1978) associative socialization hypothesis. The Euclidean distances for EPA profiles for feeling shame and anger range from 8.37 to 29.61 with a median of 19. Such high Euclidean distances are instructive for three reasons. First, if we were to use a one-factor methodology of good-bad, we would find a high association as both shame and anger are highly negative emotions. Second, recall that psychologists have tended to prefer two-factor methodologies of measuring evaluation and arousal while sociological theories have gravitated toward adding

potency to those two dimensions. However, anger is quite arousing in all five cultures, with A scores ranging from 1.16 to 2.59 while shame is slightly arousing for Taiwanese men ($A = 0.54$) to very lethargic for German women ($A = -1.76$).

Third, anger is very potent while shame is very impotent in all of our cultural tests. Hence, this test illustrates the value of three- over two-dimensional methodologies for understanding affective meanings of emotions at the same time that it clarifies why anger and shame are not mentally associated across our cultural tests.

Turner (1999a) proffers a final palette model that has been much discussed without empirical testing. We used regression analysis to test his ideas that fear and depression lead to anxiety, and fear and happiness to awe. The regression equation of $-2.3 + 1.3\text{fear} + -1.6\text{depression}$ has an adjusted r^2 of .79, in line with Turner's predicting evaluation of anxiety. The explanation of the evaluation of awe does less well, with $-0.8 + -1.4\text{depression} - 0.8\text{happiness}$ evaluation, which has an adjusted r^2 of .56, so we cannot reject either of our two empirical tests.

Still, it appears from the large constants in both cases that one has to already be experiencing very negative moods for either combination of emotions to produce the corrected new mood. The real negative evidence comes from testing for the effects of the potency and arousal dimensions. There are no significant statistical effects of the potency of either happiness or depression on the potency of feeling awe in a four-culture test. Similarly, the potency and arousal of anxiety show no statistically significant effects of the potency and arousal of either fear or depression.

Finally, we tested Turner's (1999b) predictions about how secondary emotions arise with regression analyses for predicting anger, awe, bitterness, calmness, depression, dissatisfaction, discontentment, envy, fear, happiness, remorse, pride, and sadness from Hypotheses 4c. For example, consider $\text{remorse} = \text{sadness} + \text{fear}$. There are nine permutations of the three dimensions for each hypothesis, so we judged the results of 90 regression analyses. The results are univocal in rejecting Turner's predictions. Only 3 of the 90 regression analyses were statistically significant at the .10 level or higher, which could easily have been by chance alone.

We have found no empirical support for any of the first three genres of theories by testing Hypotheses 1 through 4. Hypothesis 5 offers a test of the contention of Johnson-Laird and Oatley (1989) that all true emotions are part of five semantic families corresponding to the universal emotions of happiness, sadness, fear, anger, and disgust. If there are indeed families of emotions organized around universal emotions, affective meaning of

emotions should reveal empirical categorization into these families of related emotions.

Theoretically defined categories should not overlap empirically. Abstraction and the identification of higher order categories in cluster analysis are compatible with the extraction of higher order meaning from the affective-meaning ratings of emotion words. *K*-means cluster analysis searches for meaningful categories through dichotomously excluding and including the most relevant relatives according to their qualitative meanings. Multivariate Euclidean squared differences operationalize *K*-means cluster solutions among all variables (Schneider and Roberts 2004).

If primary emotions actually are basic elements in the organization and construction of human emotional experiences, they should be sufficiently different to universally define distinctively different clusters of emotions. Assuming that something like a universal set of primary emotions actually exists, the extracted clusters should represent landmarks on an intersubjective emotional map that do not overlap. The Johnson-Laird and Oatley (1989) theoretical definition of five universal, basic, or primary emotion modes (happiness, sadness, fear, anger, and disgust) should be reflected in an empirical organization of five distinctive clusters.

Due to our strict application of blind back-translation techniques, not all emotions are rated in all five cultures. To be cross-culturally comparable, Table 3 presents the results of a *K*-means cluster analysis with 53 emotions words common to all five cultures defined by the common component existing across cultures. Since this restriction in the number of emotions imposes limitations on mapping the culture-specific organization of emotions, we also conducted a cluster analysis (not shown) in which we considered all 99 emotion words available to us. This more inclusive analysis, however, is not directly comparable across cultures. Happily, both analyses produced very similar results. Thus, we focus on the interpretation of the intercultural common component of emotions extracted for cross-cultural comparativeness and refer to differences between the cluster analyses.

In all five cultures, and across both sex-based subcultures, the emotion of happiness forms the basis for a distinctive cluster that is not shared by any of the other four emotions theoretically identified as primary. The distinctiveness of happiness is clearly paralleled in the unique classification in all cultures and sex subcultures in Table 3. We would expect this distinctiveness for all primary emotions if they truly organize our emotional experiences. However, in one or the other cultures or subcultures, all other primary emotions shared another primary emotion in their cluster.

Table 3
Correct Cluster Classifications Into Five Primary Emotions
by Culture and Sex Using Common Component^a

	Happy	Sad	Afraid	Angry	Disgusted	Correct	Sex Agree ^b
U.S. male	2	1	1	3	4	3	
U.S. female	2	1	1	3	3	1	4
Canadian male	2	3	1	3	1	2	
Canadian female	2	1	1	5	1	3	3
German male	2	1	1	4	4	1	
German female	2	1	1	4	4	1	5
Japanese male	2	5	1	4	4	2	
Japanese female	2	1	1	4	4	1	4
Taiwanese male	2	1	1	4	4	1	
Taiwanese female	2	1	1	4	4	1	5

a. Correct if only one primary emotion was classified in one cluster. $N = 53$ emotions common across all five cultures.

b. Sex Agree column shows agreement in the correct or incorrect classification by men and women.

To comparatively rate the distinctiveness of primary emotions, we created an index that rates the correct classification in each culture and subculture. The correct classification is achieved if a primary emotion does not share another primary emotion in its cluster. Subcultural agreement is achieved if the analysis of data of men and women results in identical (correct or incorrect) classification of a primary emotion. In this way, the cultural and the subcultural indices theoretically range from 0 (perfect nonagreement) to 5 (perfect agreement).

Although Table 3 lists the cluster numbers assigned in the empirical analysis, cluster numbers themselves have no theoretical bearing. As in the case of happiness, all cultures and subcultures assigned the same cluster to fear. However, only the data for Japanese men presume that fear is a distinctive cluster of emotions. In all other cultures and subcultures, at least one other primary emotion joins the cluster occupied by fear. In the case of Canadian men, two other primary emotions, sadness and disgust, join the cluster.

Furthermore, there is no cultural agreement for the unique classification of sadness, anger, or disgust. Our cultural classification index empirically ranges from 1 to 3 (or correctly classifies between 20 percent and 60 percent of these three emotion words as uniquely clustered). Only 16 of 50

(32 percent) possible cases replicate a correct theoretical classification of the primary emotion modes assumed by Johnson-Laird and Oatley (1989).¹¹ Men and women attain 21 of 25 (84 percent) identical (correct or incorrect) classifications. This implies, as expected, that within-culture differences are smaller than differences across cultures (Schneider 2002). Put differently, men and women within each culture are more intersubjective than persons across cultures.

The classification of primary emotions into identical clusters logically implies the creation of clusters in which none of the theoretically identified primary emotions are present. An analysis of these empirically defined clusters identifies problems in the theoretical classification of primary emotions. It is, for example, striking how U.S. men and women agreed on three of five positive emotions (calm, moved, and relieved) in their empirical definition. As in the U.S. data, Canadian men and women agree on the empirical creation of positive clusters. Their common component—shared with the U.S. empirical cluster—is defined by the emotions of calm and moved. Canadians men and women also agree to add a small cluster of passive emotions including words such as melancholic.

A cluster of passive emotions is also found in the German cluster solution in which calm and excited appear to be extremes that emerge as single-item “clusters” for men and women. A cluster of passive emotions also reaches high agreement between men and women in the Japanese and Taiwanese cluster solution. As we see in cross-cultural and subcultural comparison, pleasurable emotions with low activity are not sufficiently represented in the theoretical construction of primary emotions.

We reject Hypothesis 5 on the grounds that the five emotion families proposed by Johnson-Laird and Oatley (1989) do not replicate cross-culturally. To test the robustness of our rejection, we increased the number of clusters to induce the overlapping clusters to break up and differentiate more effectively between the emotions of anger, fear, and disgust. A six-cluster solution produces single-item clusters, which, in an explorative cluster analysis of denotative meaning, indicates that the cutoff point for increasing the number of clusters is overstepped (Schneider 1999). For that reason, it is not surprising that a seven-cluster solution produces single-item clusters (an oxymoron) in 7 of 10 cases (5 cultures $\times$ 2 sexes). These additional tests strongly confirm our rejection of Hypothesis 5.

As expected, there are fewer pleasurable emotions that are cognitively differentiated in all five cultures. This might simply be because humans do not ponder nuances of happiness. Nevertheless, both unpleasant and pleasurable emotions are well spread out on the emotional map, which

presumes that emotions provide valuable information on specific role identities and event schema. The sheer number of negative and active emotions may have misdirected research in a fruitless search for universal, basic, or primary emotions.

Discussion

Subjectively experiencing a feeling is a necessary but not sufficient component of any emotion. As Johnson-Laird and Oatley (1989) assert, emotions also allow for efficient means of intersubjectively signaling and communicating without the need for understanding their causes. However, this still begs the question: What causes particular feelings and expression of various emotions? Sociologists have had much more to offer concerning this question beyond the traditional biological and psychological explanations to which we have lent suspicion.

The starting point for many sociological investigations is Kemper (1978), who weaves hardwired, autonomic, emotive responses to perceptions of changes in the microinteractional structure of status (pleasure) and power (dominance). A few examples of his propositions include the following: Perceptions that a person has gained in power relative to others should prompt happiness or security; gains in power by others might lead to fear or anxiety; opinions of self-instigated gains in status ought to activate pride, but loss of status attributed to others should cause anger.

A major strength of Kemper's (1978) approach is its clear compatibility with the classical microinteractional theories of Mead (1913), Cooley (1970[1902]), and Goffman (1959). It matters that individuals imagine how they appear to others. Making judgments of the relative amounts of and changes in power and status of self versus others is important to emotional expression.

Also, perceptions of self-presentations on maintaining and losing face influence emotional displays. Kemper's (1978) approach is also compatible with more recent approaches such as affect control theory and emotion management theory (Lively and Heise 2004).

A major weakness is that Kemper's (1978) theory of status and power change makes systematic predictions for only a small subset of 15 from the entire domain of emotion words: anger, anxiety, awe, depression, fear, grief, guilt, happiness, jealousy, (being in) love, pride, sadness, security, shame, and unhappiness. Other weaknesses include (a) that his theory

requires different causes for other emotions and (b) explanations are given for only the status and power dimensions.

Most recent sociological attempts to understand the causes of emotions have focused on predicting the general valence of affect. For example, Ridgeway and Johnson (1990) tie expectation states theory to the unipolar dimension of positive versus negative affect. Tests of exchange theory (Lawler and Yoon 1996; Mohm 1997; Stets 1997; Willer, Lovaglia, and Markovsky 1997) demonstrate that positive and negative affect signals the future of, or threats to, relationships important to a broader theory of emotions. Identity control theory attempts to explain the causes of negative affect—in particular, anger (Stets 2003). The work of such theorists, it is important to note, is not inconsistent with the assumptions of Lively and Heise (2004) in linking emotional experiences to a variety of social structural, circumstantial, and personal variables. Nevertheless, the ultimate goal should be to work toward a more comprehensive accounting of the entire domain of emotions—rather than just negative emotions or, more generally, positive and negative affect.

More modest yet are attempts to focus on the rise of single (or a few) emotions such as embarrassment (Goffman 1959; Miller 1996), shame and guilt (Scheff 2003), and love (Sternberg, Hojjat, and Barnes 2001). All of these efforts are commendable but lack integration into an overarching theory. Such a sociological theory must eventually

1. produce findings that are consistent with modern evolutionary, biological, or psychological underpinnings;
2. encompass the corpus of true emotions;
3. generate falsifiable hypotheses for critical tests of other theories of emotions;
4. be amenable to both quantitative and qualitative tests;
5. allow for cross-cultural tests and replications; and
6. incorporate, or at least articulate with, standard assumptions (e.g., influence of status, potency, arousal; role of cognitive appraisal; feeling rules; emotional management; and influence of cultural standards and norms, role identities, labeling, and attribution).

Lively and Heise (2004) have taken the first empirical steps toward satisfying these criteria through using affect control theory and emotion management theory to demonstrate empirical support for how the larger corpus of emotions may emerge from emotional stations, identity processes, participation in events, and social norms. We believe that our

strong disconfirmation of four competing genres of emotion theories complements Lively and Heise's segueing of emotion management and affect control processes.

While not empirically driven, affect control theory is probably one of the most highly empirically operationalized theories (Schneider and Heise 1995). In this very spirit, affect control theory listens to the data. The empirical quantitative treatment of emotions as EPA profiles does not make it necessary to divide emotions into primary and secondary emotions. As one of our reviewers correctly points out, affect control theory does not worry about this differentiation because it can compute a vast number of emotion words without the need for *a priori* differentiation.

Conclusion

We tested and rejected a number of hypotheses implied by major theories of emotions with more than 2,000 statistical tests. The clearest finding is that the value of focusing on universal, primary-secondary-tertiary, or basic-complex distinctions consistently receives absolutely no support from our five-culture tests. Our data mirror the (untested) skepticism of Clore et al. (1987) over the explanatory or predictive value of such distinctions. Similarly, Ortony et al. (1988) are inclined to reject the idea that there is a set of basic emotions such that any sort of palette theory can account for the others. Using different empirical methods from our own, they also empirically show the implausibility of Plutchik's (1962, 1980, 2002) mixture model. Likewise, Russell (1994) demonstrates that it is impossible to replicate so-called universal emotions with the methodology of Ekman (1971) without introducing pretest training and forced-choice formats.

Our analyses of five hypotheses indicate the doubtfulness of any universal-secondary, color-wheel palette, and socialized palette differentiation or family-cluster theory of how the large number of human emotions arose or are elicited. Our rejection of the first hypothesis, in fact, lends credence to the assumptions of affect control theory as well as Ortony et al. (1988) that no particular emotion should be seen as more semantically basic or fundamental than any other, even if a small set of emotions evolved universally.

Our findings strongly suggest that so-called universal, basic, or primary emotions—even if biologically hardwired into human neurology—are not statistically distinguishable from secondary or tertiary emotions. Future

research into the myriad of emotions needs to focus on the specific predictive and explanatory value of individual emotions as pioneered by Kemper (1978) and Heise and Calhan (1995). Lively and Heise (2004) present a more enticing set of evidence for explaining and predicting how particular emotions may arise and are displayed through affect control theory and emotion management theory (without using affect control theory methodology), so it is implausible that our results are an artifact of our operationalizations.

Our cluster analysis produces results that are consistent with the findings of Lively and Heise (2004) that the emotional expression of men and women is more intersubjective than each sex believes. Cross-cultural differences among emotions vary more than within-cultural differences of men and women in all five of our tests. The broad range of intersubjective emotional expression most likely arises out of specific social and cultural contexts even though the expression of specific emotions is undoubtedly limited by evolutionary adaptations of human physiology.

The early quest of Ekman (1971) to discover a biological basis for universal emotions forecast social interactionism. The original work combined situation descriptions with emotion labels such as "You feel sad because your child died." However, Wang and Markham state, "There may be slight differences between people in situations that give rise to various emotions, such as differences in what is considered disgusting" (1999:399). A third of a century of empirical affect control studies shows this could not be further from the truth. Standardized situations lead to very different emotional labels for Americans, Canadians, Chinese, Germans, Japanese, and Taiwanese (Smith and Francis 2005; Smith and Yap 2006).

Furthermore, although the original cross-cultural studies of the Facial Action Coding System (FACS) did produce high agreement of raters, approaching 90 percent for at least six emotion labels, replications in Japanese (Matsumoto 1992) found coefficients of rater agreement of only 64 percent for anger and 55 percent for fear. Similarly, a Chinese replication (Wang and Markham 1999) produced a set of FACS photos averaging 70 percent interrater agreement. Compare that to affect control theory studies using roughly 99 emotions in Japan and the United States with emotion equations with adjusted r^2 of .84 to .89 (Smith, Matsuno, and Ike 2000) for predicting emotions from specific interactional situations using all three dimensions.

Finally, we have found evidence consistent with the methodological value of using three-dimensional over two-dimensional methods of studying emotions. For example, Kemper (1978) assumes that anger and shame

should be associated based on their similar evaluation and arousal. However, potency differentiates the two: Shame is a very vulnerable emotion while anger is empowering in all five cultures. Potency is the primary distinguisher of other important emotions when three dimensions are considered. For negative emotions of low activation, high versus low potency differentiates disappointed from crushed, sorrowful from miserable, blue from depressed, and so on. For negative emotions of high activation, potency is necessary to discriminate between furious and petrified, impatient and terrified, agitated and tormented, irked and frightened, and numerous other emotions. This clarifies why emotions that appear to be mentally associated when using only the evaluative and arousal dimensions are clearly perceived as unassociated after introducing the third dimension of potency.

Little recognized by proponents of two-dimensional circumplex models, Ekman (1982) first anticipated the need for three dimensions in describing emotions universally. Heise (1982, 2007) incorporated Ekman's FACS facial emotion recognition system into the affect control theory simulator INTERACT. First, positive evaluation is universally recognized by (a) curving lips up or arched-up brows versus (b) curving lips down or raised brows for negative evaluation. Second, higher potency is expressed through moving the mouth or the upper lip higher. Third, more arousing emotions are expressed universally through dropping the lower lip, narrowing the mouth, and opening the eyes wider. Thus, we conclude that a closer reading of the classic literature is in agreement with our own analyses that three, not two, dimensions give greater predictability of all emotions.

Notes

1. We are not referring to Kemper's (1978) earlier theory on the importance of status and power, which has received considerable empirical support.

2. Clore, Ortony, and Foss (1987) make a parallel argument for differentiating between distinguishable emotions.

3. One anonymous peer reviewer suggested that researchers no longer take Plutchik's (1962, 1980, 2002) theory seriously. Our online search of the ISI Social Science Citation Index indicates that his 1980 article has received a total of 523 journal citations over the past 25 years and averaged more than 25 citations per year from 2000 to 2006 in a diverse range of academic journals including psychology, sociology, business, architecture, and music.

4. Acceptance and expectancy do not meet Ortony and Clore's (1989) definitional requirements, so we do not test the acceptance-disgust and surprise-expectancy portion of this hypothesis, nor 17 other tests proffered by Plutchik (1962, 1980, 2002) that do not meet our strict definition of an emotion.

5. Plutchik (1962, 1980, 2002) distinguishes between universal and primary emotions, unlike most other theorists, who consider them the same phenomenon.

6. The list is publicly available on the Indiana University Web site at <http://www.indiana.edu/~socpsy/ACT/data.html>.

7. Viewable with German, Japanese, and traditional Mandarin fonts on the Indiana University Web site at <http://www.indiana.edu/~socpsy/ACT/SDscale.html>. The original stimuli are available from the authors by request.

8. Dave Heise provided us with recent 2003 U.S. evaluation, potency, and activity (EPA) scores for comparison with the 1988 emotion data. Fifteen-year test-retest correlations for that data are only slightly lower, impressively averaging about .85.

9. These are the sum of the squared differences between EPA ratings for across-culture pairings.

10. To make sure we don't miss plausible, important "mixing" effects of dimensions, such as the possibility that awe = the goodness of happiness plus the vulnerability of fear, we also tested for all cross-dimensional effects in our appraisals of Hypotheses 4a through 4c.

11. The cluster analysis involving all emotion terms in every culture produces very similar results. Happiness is correctly classified in all cultures, and one emotion, sadness, is in the same cluster in every culture and subculture. While this cluster solution is very similar, the number of correctly identified cases increases from 32 percent to 50 percent. This rise in the proportion of correctly classified emotions, however, is a methodological artifact. If the number of clusters is kept stable, the larger the number of cases, the lower will be the likelihood for one case to be in the same cluster as another case. The larger number of cases therefore affects our index of correct classifications. This does not speak against the index in general. Traditional significance testing, while widely accepted, is also influenced by sample size.

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