Universals and Cultural Variations in Emotional Expression

By

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Abstract

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One of the most fascinating characteristics of emotions is that they have universal expressive patterns. These expressions, which are encoded through multiple bodily channels, allow us to identify distinct emotions in ourselves and others. After groundbreaking theorizing by Charles Darwin and early empirical work by Ekman and Izard, further research in emotion science revealed evidence in single cultures for more emotional expressions above and beyond the well-studied set comprising of anger, contempt, disgust, fear, happiness, sadness, and surprise. Some of these new emotions were displayed using nonfacial modalities, such as the voice, touch, and posture. Following the logic set forth by these methods and findings, we tested two hypotheses: 1) there are more than seven universal expressions of emotion; 2) expressive universality is not limited to facial expression.

Findings from three cross-cultural experimental studies yielded support to the above hypotheses. Our first study collected 5500 expressions of twenty-one emotions from five different cultures. Spontaneous behavioral analysis revealed core facial and bodily patterns for each of the 21 states across all five cultures. Additionally, we uncovered over 100 cultural variations to the universal patterns and hundreds of individual variations. We concluded from this study that there exist new potential universal expressions above and beyond the well-studied emotions. In a second study, we found that these core patterns were reliably decoded by naïve raters in 10 different countries. In this experiment, non-American participants rated the expressions of American actor-posed stills and acoustic recordings. We concluded that the new expressions were recognized universally and were reliably distinguished from the well-studied emotions anger, disgust, fear, happiness, sadness, and surprise. Furthermore, nonverbal acoustic expressions of emotion were universally recognized at rates comparable to or greater than facial expression.

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Universals and Cultural Variations in Emotional Expression

I. Introduction

The scientific study of emotion is nearly 150 years old and has gone through transformative changes. It is a field ripe with zeitgeist-changing empirical advances, but it is also filled with theoretical controversy. In this dissertation, we draw upon the past 15 decades of emotion science, inspired originally by Charles Darwin, to advance the scientific study of emotional expression in two ways. We seek to document new nonverbal displays of several, previously unstudied emotions. Second, we seek to document the universality and cultural variations in these emotional displays.

II. Markers of Emotional Expression

When taken together, scientific research on emotion communication tends towards four key features of expressive behaviors (Matsumoto, D., et al., 2008); nearly all studies of emotional expression begin from these assumptions. A first is that there are reliable nonverbal markers of emotional states that transcend cultural boundaries. These behaviors express a select group of discrete emotional states, and the universal patterns are most pronounced when the felt state is unregulated. A second is that there is a correlation between felt internal states and expressed external states. This covariance can be stronger or weaker depending on the emotion, its intensity, the culture of the participants, gender, and individual differences (e.g., Mauss, I., et al., 2005). A third agreement throughout the emotion literature is that emotion concepts embody a coherent package of emotional responses, reactions, appraisals, themes, metaphors, and antecedent events. Despite a strong case for the impossibility of exact translations of emotional lexica, there are still broad emotion concept themes that hold across cultures (Russell, 1991). A fourth guiding notion began with the tradition of Darwin, who claimed that emotional expressions are reliably judged as discrete categories across cultures (e.g., Ekman, 1992; Etcoff, N., Magee, J., 1992). When little or no situational context is added to an emotional expression, these signals are similarly categorized as individual emotional states around the globe.

III. The Darwinian Perspective

The science of emotion psychology has its foundation in *The Expression of the Emotions of Man and Animals* (1872), which Darwin published after *The Origin of the Species* (1859) and The Descent of Man and Selection in Relation to Sex (1871). In The *Expression of the Emotions of Man and Animals*, Darwin drew upon his observations of adults, infants, and other species to make the following claim: if humans evolved physically adaptive characteristics from specialized primates, then perhaps we evolved psychologically and behaviorally adaptive characteristics as well. He made the radical argument that instead of being disruptive and pathological, emotions are adaptive residual behaviors – evolved out of more complex patterns of behaviors in other species – that helped humans respond adaptively to their environments in the course of their evolution (Shariff & Tracy, 2011; Ekman, 2007).

Darwin's thesis on emotion is an extension of his hypothesis that environmental and sexual selection pressures lead to differential success rates in the offspring of all species. An organism with features that support adaptation to its environment has a higher probability of thriving and reproducing, thereby passing these adaptive features to its progeny. The features present in the

current generation of a species have been probabilistically selected over tens of thousands of reproductive iterations (Hess & Thibault, 2009). It is easy to see that all humans have adaptive physical characteristics such as opposable thumbs, limbs, organs, skin, a central nervous system, and a brain. By extension, human traits like emotions should serve similar adaptive functions (see Keltner & Gross, 1999).

According to Darwin, emotional expressions originally were part of more complex behavioral responses to specific events in the environment. Over the course of our evolution, these displays acquired communicative value by signaling internal states beneficial for others to know. Through this process, specific displays came to acquire signal value in expressing specific emotions to others. Emotional expressions in modern society are simply residual actions that used to be powerfully adaptive many generations ago. Their original use was not communication, but rather to serve a physical function: "Although [expressions] often reveal the state of the mind, this result was not at first either intended or expected. (p. 356)" He also described over 50 discrete emotional states in terms of expression, physiological changes, and hypothetical functions towards environmental adaptation.

"…it is notorious how powerful is the force of habit. The most complex and difficult movements can in time be performed without the least effort or consciousness." (p. 29)

In more specific terms, through observations of adults, babies, dogs, neighborhood cats, chimpanzees, and insects, Darwin posited three general principles of expression. The first principle is "Serviceable Associated Habits", which claims that expressions are residual actions of more complete behavioral responses. Certain complex actions, such as fists clenching, brows furrowing, screaming, snorting, nose wrinkling, blushing, crying, etc. are all used to either directly or indirectly gratify certain sensations and desires. Regardless of the intensity of a behavior, if an action serves to gratify a desire, it will be repeated often, becoming a habit. The movement will be performed often without conscious thought in response to a stimulus. Darwin posited that there may be some inheritable characteristics to serviceable habits, especially if the desire it gratifies is helpful to survival. For example, an adaptive habit for anger, an emotion of opposition and combat, is clenching of the jaw and fists. If habits or tendencies are inheritable, then Darwin argues that these actions would serve our species well when confronted with an enemy ready for battle. Receiving a blow to a loose jaw causes more damage than a clenched, protected jaw; delivering a blow with a loose fist will similarly incur more damage than delivering a blow with a clenched fist. Even extremely subtle actions, like raising the eyelids in fear and surprise, can become a serviceable habit if they allow the organism to increase visibility of its surroundings during an event of unexpected threat. These actions have followed us through the lines of our ancestors and have survived to the present, where they are often not functionally needed as they were originally intended. In the present iteration of our species, these serviceable habits have become primarily socially communicative. Facial, vocal, tactile, and bodily responses are therefore individual elements of a fast, coordinated response pattern involving multiple bodily systems, which signal specific emotions to conspecifics.

"Let us now suppose that the dog suddenly discovers that the man he is approaching is not a stranger, but his master; and let it be observed how completely and instantaneously his whole bearing is reversed." (p. 51)

The second Darwinian principle of emotional expression is "Antithesis", which claims that opposing states of mind are signaled in opposite patterns of nonverbal behavior. In his primary

example, Darwin describes a dog approaching a stranger while walking upright and stiffly with its tail erect, teeth bared, hairs pricked up on its back, eyes fixed into a stare, and vocalizing a growl. These behaviors are likely the result of a serviceable habit meant to prepare the dog's reaction to a perceived threat. When the dog, however, sees that the stranger is his master, an opposite pattern of behaviors arises; the body relaxes, the dog rolls onto its back, the tail relaxes and wags, the tongue comes out, the eyelids relax, and he vocalizes a playful bark or whimper. Darwin argues that this latter set of behaviors is not at all serviceable to the dog in this emotional situation, but they have developed to clearly express the notion of *"opposite to threat"*. The principle of antithesis posits that since emotional communication is of high value to many species, it is possible that some sets of behaviors evolved not out of physical function as in the principle of serviceable habits, but rather as variations of serviceable behaviors. Even more specifically, these variations are discussed as "opposites" or "antitheses" to their counterpart serviceable habits.

In the present wave of emotion science, it is impractical to consider affective states as "opposites," but the idea that behaviors can evolve purely from the need to communicate has had great influence on present theory. One clear example of this is the self-conscious or hierarchical emotions, such as the low-status displays shame and embarrassment (Keltner & Buswell, 1997). Though these two states may not serve to gratify a specific desire, they are key displays that communicate status and affiliation. For a social species such as *homo sapiens*, where survival depends on our ability to delegate roles and resources, communicating hierarchical position is critically important. Pride, for example, is a high-status dominance display involving postural expansion with the head up and chest out. Shame, the antithesis of pride, is a low status display involving postural constriction with the head down (Tracy & Matsumoto, 2008).

> *"Of course every movement which we make is determined by the constitution of the nervous system; but actions performed in obedience to the will… are here as far as possible excluded." (66)*

There is a class of behaviors that cannot be readily explained by the principles of serviceable habits and antithesis. To these displays Darwin bestowed his most lengthy title: "the principle of direct action of the excited nervous system on the body", or herein referred to as "involuntary excitation of the nervous system". This principle posits that some emotional displays originate from involuntary impulses from the nervous system; this discharge of physiological excitement directly causes downstream behavioral changes, which we associate with feelings of the emotion. These behaviors include physiological changes in heart rate, breathing, sweating, blinking, muscle-twitching, complex bodily movements, etc. Darwin further classified some emotions as having more external involuntary changes, such as anger; other emotions have more internal changes, such as affection. Involuntary changes need not be adaptive for every instance of the emotion, and often, they are not. For example, the heart-racing, capillary-dilating effects of anger are present even in situations where preparing to physically fight is impractical, such as when we forget our office keys at home. In actual combat, however, the physiological changes associated with anger have served us well throughout the history of our species, which is why these changes are present in the current iteration of *homo sapiens*. Additionally, the principle of involuntary excitation of the nervous system laid the theoretical framework for how we currently study the bodily changes of discrete emotions.

"Laura Bridgman, from her blindness and deafness, could not have acquired any expression through imitation, that when a letter from a beloved friend was communicated to her by gesture-language, she 'laughed and clapped her hands, and the colour mounted to her cheeks." (197)

The final contribution from Darwin's work is his categorization of emotional states and the nonverbal displays within each state, which he hypothesized to be universal. Across eight categories and 60 emotion concepts, *The Expression of the Emotions of Man and Animals* highlights hundreds of facial, vocal, tactile, bodily, and physiological changes specific to discrete emotions. Table 1 illustrates these categories and emotion concepts using the lexicon that Darwin developed. Darwin (1872) reserved eight chapters for discussing specific emotion concepts and terms. Our Table 1 illustrates each chapter heading as the emotion category under which Darwin wrote about specific emotion concepts and terms.

Table 1.
Darwin's categories of emotion terms, and the emotion concepts within each category.

Chapter, Pages	Category	Concept
VI, 146-175	Present in human and nonhuman animals	Joy, affection, pain, anger, astonishment, terror
VII, 176-195	Suffering, weeping, & low spirits	Grief, suffering, weeping, sadness, low spirits, anxiety, dejection, despair
VIII, 196-219	High spirits	Joy, high spirits, love, tender feelings, devotion, laughter
IX, 220-236	Reflection	Reflection, meditation, ill-temper, sulkiness, determination, moroseness, obstinacy
X, 237-252	Hatred & anger	Hatred, anger, rage, indignation, sneering, defiance
XI, 253-277	Disdain	Disdain, contempt, disgust, guilt, pride, helplessness, patience, affirmation, negation, disdain, scorn, guilt, deceit, impotence
XII, 278-308	Surprise & fear	Surprise, astonishment, fear, horror, terror, admiration
XIII, 309-346	Self-attention	Shame, shyness, modesty, blushing, embarrassment

Soon after the publication of Darwin (1872), there came a flurry of rebuttals claiming that emotional expressions were not outward signs of inward states, but rather they were culturally learned behaviors (for a review see Bruner & Tagiuri, 1954). Specifically, there were several articles published in the early 1900's that found emotional expressions were decoded at chance rates only across cultures; these articles concluded that at best, emotional expressions are culturally learned and are not consistent across cultural boundaries. This view was unchallenged until

Ekman, Friesen, & Ellsworth (1972) compiled data which supported Darwin's (1872) thesis that emotions are an evolutionary component of our species (see Izard, 1971; Ekman, Sorenson & Friesen, 1969; Ekman et al. 1987), the result of which was a first wave of universal expression research and the beginning of a new field in psychology.

IV. Evolutionist Approach to Facial Expression

The evolutionary approach to facial expression is grounded in the work of Darwin (1872/1998) and refined by a first wave of studies that elaborated on his perspectives (Tomkins, 1962/1963 Ekman, 1971/1992b; Izard, 1971; Izard & Malatesta 1987). Within this framework, a central theory is that facial expression should covary with emotional experience, and that discrete emotional themes should give rise to specific expressive patterns in the body (Ekman, 1989; Ekman & O'Sullivan, 1991; Ekman & Friesen, 1982; Ekman & Rosenberg, 1997). Also, expressions that co-occur with felt emotional states should be the most reliable signals of internal states, since often these actions are beyond voluntary control (R.H. Frank, 1988; Gonzaga, Keltner, & Londahl, 2001). Emotional expressions are more than simply external displays of internal states; they are also critical to coordinating social interaction in everyday human interaction (Keltner & Kring, 1998), providing information about how we perceive our environment (Ekman, 1993; Scherer, 1986), offering information about our intentions (Fridlund, 1994), and indicating hierarchical or relational status in group situations (Keltner, 1995; Tiedens, Larissa, Ellsworth, & Mesquita, 2000).

A core theme in the evolutionary approach to expression is that across cultures, all human beings need to respond to similar types of fundamental life situations relevant to survival and social life. Themes such as loss (Bonanno, Mihalecz, & LeJeune, 1999), restoring order through justice (Smith & Lazarus, 1993), hedonic pleasure (Uchida & Kitayama, 2009), threat (Oest & Hugdahl, 1981), and social status (Keltner, 1995; Tracy & Robins, 2007) are core to the human experience and demand our attention at the risk of our survival. Since all human beings have the same facial anatomy regardless of race, culture, or gender (Gray 1971), and since our facial musculature is activated in emotion-specific ways during fundamental life situations (Tomkins, 1962/1963), the evolutionary approach to expression posits that there are patterns in expressive behavior for all humans.

In affect theory, these themes are organized into discrete emotional categories, each one defined by prototypical response patterns, subjective experiences, memories, and stories (Tomkins, 1962/1963). Inspired by the Darwinian categories of emotion, Silvan Tomkins (1962; see also Nathanson, 1992) made a first attempt to distill emotions down into nine fundamental and discrete categories, outlined in Table 2 below. According to Tomkins, these nine affects are primary and can combine into more complex states, and for optimal mental health it is important to maximize the "positive" affects and minimize the "negative" affects. Before Tomkins' time, the valence dimension of emotions (positive/negative/neutral) had not been used. The discrete emotion categories in Table 2 also encouraged the development of the Facial Action Coding System (Ekman & Friesen, 1978), a muscle-by-muscle annotation method for describing changes in facial anatomy.

Table 2.
Darwin's & Tomkins' descriptions of nonverbal displays for nine widely-referenced emotions.

Emotion	Darwin's description	Tomkins' description
Anger/Rage	Head erect, nostrils raised, mouth compressed, brow furrowed, eyes wide, chest expanded, arms rigid by sides, stomping foot, body swaying back and forth, trembling limbs	Frowning, clenched jaw, red face (negative valence)
Disgust	Downturned lower lip, raised upper lip, expiration, open mouth, spitting, blowing out, protruding lips, throat-clearing, lower lip and/or tongue protruding	Lower lip raised and protruded, head forward and down (negative valence)
Dissmell (Tomkins, 1962)/ Contempt (Darwin, 1872)	Protruding lower lip, wrinkling nose, eyelid closure, gaze aversion, upper lip raised, snorting, expiration	Upper lip raised, head pulled back (negative valence)
Distress/Anguish	Lip corners downturned, inner corner of eyebrows raised, low spirits	Crying, rhythmic sobbing, arched eyebrows, downturned lips (negative valence)
Excitement/Joy	Zygomatic and orbicularis muscles contracted, upper lip raised, nasolabial fold formed, muscles trembling, purposeless movements, laughter, clapping hands, jumping, dancing, stamping, chuckling/giggling	Smiling, lips wide and out (positive valence)
Fear	Eyes open, mouth open, lips retracted, eyebrows raised, crouching, paleness, perspiration, hair standing on end, muscles shivering, yawning, trembling	Frozen stare, pale face, coldness, sweat, erect hair (negative valence)
Interest/Excitement	Head forward, eyes sparkling, eyes wide, high spirits	Eyebrows down, eyes tracking, eyes looking, closer listening (positive valence)
Shame/humiliation	Head down, face hiding, low spirits, oblique eyebrows, blushing	Eyes look down, head slumps, blushing

Surprise/Startle	Eyebrows raised, mouth open, eyes open, lips protruding, expiration, blowing/hissing, open hands high above head, palms toward person with straightened fingers, arms backwards	Eyebrows up, eyes blinking (neutral valence)

There have been at least 25 studies that document these and other emotional expressions using objective coding methods (Table 3, adapted from Matsumoto, Keltner, Shiota, O'Sullivan, & Frank, 2008). A first wave of studies to support the universal expression hypothesis with respect to the well-studied emotions comes from experiments that measure expressive responses to elicited emotional states (see Table 3). The first in a wave of such studies tested the facial reactions of Japanese and American participants while watching a gory, disgust-inducing video (Ekman, 1972). Ekman used the Facial Affect Scoring Technique, a precursor to the Facial Action Coding System, to painstakingly code three minutes of candid video footage of each participant watching the video. When the experimenters were not present in the room with the participant, the correlations between Japanese and American disgust expressions ranged from .72 to .92. Similar emotion elicitation methods have been used in the studies outlined in Table 3, with the exception of one study which used a "method acting" method to produce emotional expression through thematic story prompts (Gosselin, Kirouac, & Dore, 1995; see also Ekman, Hager, & Friesen, 1981; Hager & Ekman, 1985; Ekman & Friesen 1982; Motley & Camden, 1988; Wagner, MacDonald & Manstead, 1986; Stanislavski, 1958).

Table 3.
Studies Examining Facial Expressions of Emotion adapted from Matsumoto, Keltner, Shiota, O'Sullivan, & Frank, 2008.

Citation	Measurement System	Emotions Studied
Bonanno & Keltner (1997, 2004); Keltner & Bonanno (1997)	EMFACS	Contempt, disgust, anger, sadness, fear, surprise, happiness
Bonanno et al. (2002)	EMFACS	Anger, contempt, disgust, fear, sadness, smiles
Camras et al. (1992)	EMFACS	Anger, disgust, sadness, fear, smiles
Chesney et al. (1990)	FACS	Anger, sadness, fear, happiness
Ekman et al. (1980)	FACS	Disgust, fear, sadness, happiness, anger, contempt, surprise

Ekman et al. (1988)	FACS	Happiness, unspecified negative emotion
Ekman et al. (1990)	FACS	Happiness
Ekman et al. (1997)	FACS	Happiness
Ellgring (1986)	FACS & EMFACS	Happiness, contempt, anger, disgust, fear, sadness
Frank et al. (1993)	FACS	Happiness
Gosselin et al. (1995)	FACS	Happiness, fear, anger, surprise, sadness, and disgust
Gross & Levenson (1993)	Emotion Expressive Behavior Coding (Levenson, 2003b)	Anger, anxiety, disgust, confusion, contempt, interest, embarrassment, fear, happiness, sadness, surprise, crying, laughter
Harris & Alvarado (2005)	FACS	Happiness
Heller & Haynal (1994)	FACS	Smiles
Keltner et al. (1995)	FACS & EMFACS	Contempt
Lerner et al. (2005)	EMFACS	Anger, fear, and sadness
Matsumoto & Willingham (2005)	EMFACS	Fear, anger, and disgust
Mauss et al. (2005)	FACS	Smiles, contempt, disgust, fear, and sadness
Gross & Levenson (1993)	Emotion Expressive Behavior Coding (messenger et al., 2001)	Amusement and sadness

Rosenberg & Ekman (1994)	FACS & Baby FACS	Smiles of happiness
Ruch (1993)	FACS	Disgust, sadness, fear, happiness, contempt, and anger
Ruch (1995)	FACS	Happiness
Soto et al. (2005)	FACS	Happiness

V. Universal Expressions

A central theme in emotion theory is that emotional expressions can be universal. The adjective "universal," when used to describe emotional expressions embodies two main characteristics (Ekman & Cordaro, 2011). One of these is that the expression can be recognized across all cultures, and that no matter where the expression is encoded, it will be decoded with high accuracy. A universal emotional expression may have some variation across cultures, but can always be recognized at least at above-chance rates globally (maybe cite Russell, 1994, here). The data for universal emotions includes facial, vocal, tactile, physiological, and narrative. The second characteristic embodied in the adjective "universal" is the view that the expression of the emotions are discrete, that they can be distinguished fundamentally from one another. This can be shown by discrete differences in facial, vocal, tactile, bodily, physiological, or cognitive processes related to the experience and expression of the emotion (Izard, 2011).

The implications of emotional expressions as universal are profound and raise many meaningful and long-standing questions (Levenson, 2011). Are emotions residual vestiges of our evolution, when instantaneous reactions to fundamental life situations meant the difference between survival and death? Or are they instead an ancient cultural meme brought about by the first tribes of humans aiming to communicate effectively? Even more simply, are universal emotional expressions purely a byproduct of globalization, accelerated by modern media? These central questions have been the topic of heated debate in emotion science, with controversies surrounding claims that emotions are discrete (Tomkins, 1962), universal (Ekman & Friesen, 1971), and innate (Izard, Fantauzzo, Castle, Haynes, Rayias, & Putnam, 1995).

All evolutionarily-based emotions by definition must be *universal*, meaning that they are encoded and decoded in similar ways across the globe, and that their meanings transcend cultural and linguistic boundaries (Panksepp & Watt, 2011). A *universal* phenomenon is one that is present in all or nearly all human beings, regardless of their history, cultural context, environment, phenotype, etc. These environmental factors can, however, strongly influence the way universal human tendencies are manifested. For example, cultural display rules can dampen, change, or amplify the way universal emotions are expressed (Russell, J.A., Bachorowski, J.A., and Fernandez-Dols, J.M., 2003). Universal emotions need not be basic, nor do they need to be limited to just one mode of expression (Matsumoto, Keltner, Shiota, O'Sullivan, and Frank, 2008). We disambiguate these terms because in the studies herein we do make claims about potential universal expression candidates, but do not make any claims about biological origins. We also do not evoke basic emotion theory to explain the cross-cultural patterns found herein (for a review of Basic Emotion Theory see Tracy & Randles, 2011).

VI. Methodological Approaches to Capturing Emotion Displays

Capturing emotional displays has typically relied on one of three methodologies (Matsumoto, 1987). A first, the most common in the literature on facial expression, is the decoding method (Hess & Blairy, 2001; Russell, Bachorowski, and Fernandez-Dols, 2003; Scherer, 2001; Elfenbein & Ambady, 2002). For studies on universal expression, the decoding hypothesis typically states that participants of different cultures or contexts will interpret images, sounds, or sensations of emotional expressions in similar ways. In this approach, participants are presented with static photos of emotional displays, or more rarely, videos of spontaneous displays, and asked to label those displays, most typically in a forced choice format. Hundreds of studies have relied on this method, and there is some consensus for universal displays of anger, disgust, fear, sadness, surprise, and happiness (for review, see Matsumoto et al., 2009; but see Russell & Barrett, 1999). For the decoding approach, criticisms have focused on the fact that forced choice methodologies artificially increase recognition rates, and that static expressions with no context fail to represent real-life emotional events (Parkinson & Manstead, 1992; Russell, 1994).

A second approach is to study the expressive correlations of the spontaneous experience of emotion (for review of over two dozen such studies, see Matsumoto et al., 2008). For studies on universal expression, the encoding hypothesis typically states that participants of different cultures or contexts will express emotions in the face, voice, touch, or posture in similar ways in response to the same stimuli. In this method, participants' emotional behavior in response to controlled stimuli is compared across cultures. The strengths of such an approach are experimental control, although doubts exist about whether the stimuli can truly elicit the same emotional states in all participants, despite cultural or individual differences. This strategy offers to maximize external experimental validity, since the stimuli often generalize to the real-world and the expressions produced represent real-life displays.

Finally, investigators can capture voluntarily-produced emotional displays. Most typically, with this method participants are given the description of an emotion, or an emotional story, and asked to express the emotion portrayed in the scenario. This has been widely used in studies of emotion-vocalization (e.g. Simon-Thomas, Emiliana, et al., 2009), and less typically in studies of facial expression (Ekman, 1973; Dashiel, 1927). There are key advantages to the voluntary-production method, especially for cross-cultural studies. The descriptions or stories can be created to capture behavior across several cultures, because the global themes within the stories control for differences in interpretation. For example, a story for sadness might be "A beloved family member has died," which incorporates the universal theme of loss. Especially when paired with the target emotion word (e.g. "A beloved family member has died, and you are feeling very sad."), the stories minimize the chance of interpretation differences due to cultural or individual effects. When responding, participants generally use "method acting", wherein they draw upon personal felt experiences with the desired emotion to elicit expressive behavior. The clear disadvantage to this approach is that such behavior is voluntarily produced and may not resemble spontaneous, felt emotional behavior (see Ekman, 1993). This most often comes in the form of exaggeration, though the key expressive behaviors are generally preserved. This strategy offers to maximize internal experimental validity, since the thematic stories are interpreted in similar ways across cultures and participants. Because of this clear methodological advantage for cross-cultural expression research, the present study employs the voluntary production strategy.

VII. New Displays

It has since been a central focus of emotion science to determine whether there are more than just a few universal emotions, or whether there are additional states that are ubiquitously recognized and discretely different from the well-studied "basic" emotions. The field's evidence that anger, disgust, happiness, and sadness have universal facial displays is robust, but the evidence for fear and surprise were less convincing (for reviews, see Elfenbein & Ambday, 2002; Matsumoto et al., 2008). To document such expressions and deem them universal, one needs to find evidence supporting both the decoding and encoding hypotheses. Furthermore, this research must include a diverse sample of different cultures that differ on important characteristics such as religion, values, self-construals, to make the claim that the expression candidates trend toward universal recognition and elicitation (Brown, 1991). Recent work in emotion science has expanded upon the original list of seven emotions thought to be universal. Expressions have been identified in one or more cultures for the emotions amusement (Keltner & Bonanno 1997; Shiota et al. 2006), awe (Shiota 2006), contentment (Hejmadi 2000), coyness (Reddy 2000), desire (Keltner & Shiota 2003; Gonzaga, et al., 2006), embarrassment (Keltner & Buswell 1996; Hejmadi 2000; Keltner & Shiota 2003), interest (Silvia 2008, Reeve 1993), pain (Prkachin, 1992; Williams, 2002; Grunau & Craig, 1987; Botvinick, et al., 2005), pride (Shiota 2006, Tracy & Robins 2004, Tracy & Matsumoto 2008), shame (Keltner & Buswell 1996, Hejmadi 2000, Tracy & Matsumoto 2008), sympathy (Keltner & Shiota 2003), and triumph (Tracy & Matsumoto 2008). More extensive cross-cultural experimentation would be required to distinguish any of these "newer" displays as universal – an aim of the current investigation.

Turning to more specific evidence of new displays, Matsumoto & Ekman (2004) found decoding evidence for a facial display of contempt involving an asymmetrical tightening of the lip corners, combined with a slight asymmetrical smile on the same side. To establish whether self-conscious emotions would elicit unique facial displays, Keltner (1995) coded muscle-by-muscle actions of participants who became embarrassed after making a silly face on camera. Careful frame-by-frame analysis uncovered a fleeting but highly-coordinated 2-3 second display (see also Edelmann & Hampson 1979, 1981), which involved gaze aversion, controlled smiles, and partial face covering with one hand. In a further study, naive participants reliably identified these spontaneous self-conscious displays as embarrassment. Keltner & Buswell (1997) analyzed three dozen studies of appeasement displays in other species, and concluded that subordinate gestures in nonhuman primates resemble facial displays of human embarrassment.

Other experiments sought to analyze self-conscious displays coincident with gaining or losing status (Jessica Tracy & Rick Robins 2004; 2007; Tracy & Matsumoto 2008). Tracy and Robins documented expansive postures coincident with the emotion pride, as well as head movements up and back, and expansive arm thrusts upward. Images of these displays were reliably decoded in both industrialized cultures and a remote culture in Burkina Faso. Tracy and Matsumoto (2008) analyzed the emotional expressions of sighted and blind athletes from 20 different countries at the 2008 Beijing Olympic Judo Games. Tracy and Matsumoto carefully coded facial and bodily actions as athletes either won or lost matches and experienced pride/triumph or shame/disappointment, respectively. Sighted and blind winners showed expansive posture, smiles, head up, and arms in the air; sighted and blind losers showed slouched posture, shoulders slumped, and chest removed. Gonzaga et al. (2001) analyzed the nonverbal behaviors that romantic partners displayed as they experienced love and desire while discussing their first date. When the romantic partners felt love, they showed displays of genuine smiling,

mutual gaze, affiliative hand gestures, open posture, and leaning forward. Similarly, when the romantic partners felt desire, Gonzaga et al. coded behaviors such as lip licks, bites, and puckering. In another series of studies on positive other-motivated emotions, Nancy Eisenberg et al. (1989) coded the facial displays of participants witnessing others suffering. They found that the experience of sympathy is correlated with oblique eyebrows, concerned gaze, and approach behaviors such as forward leans.

There is also a rich literature on the acoustic properties of emotional displays including anger, awe, contempt, content, desire, disgust, embarrassed, fear, happiness, interested, pain, pride, relief, sadness, surprise, sympathy, and triumph (Simon-Thomas, Keltner, Sauter, Sinicropi-Yao, & Abramson, 2009; Nelson & Russell, 2011; Simon-Thomas, Sauter, Sinicropi-Yao, Abramson, & Keltner, 2007; Banse & Scherer, 1996). These acoustic emotional expressions are often accompanied by discrete facial displays, but very few of these have been documented in a cross-cultural study (Sauter, Eisner, Ekman, & Scott, 2009). Laughter, for example, is a non-verbal vocal expression of joy/amusement and has been part of the human communication system for thousands of generations (Dunbar, 2004; Provine, 1992, 1993; Provine & Fischer, 1989). Facially, the expression of joy/amusement involves a Duchenne or "genuine" display of happiness, where the eyes contract as the lip corners pull upward. Amusement also involves a head tilt back, and often the jaw will drop as the laughter vocal burst is emitted (Ruch & Ekman, 2001; Panksepp, 2005).

VIII. New Modalities

Though it may seem intuitive that emotional expressions extend to other modalities other than the face, the vast majority of the expression literature focuses on facial displays. There are many reasons for this. A first is that as a visual culture, visual displays of emotion are the most interesting and salient to us. Our subjective vocabulary for emotions is often steeped in a visual tradition: we metaphorically refer to emotions with visual concepts, such as “red with anger”, “a long face”, “feeling blue”, “a bright smile” etc. A second is that the most advanced coding techniques have been developed for facial behavior, since the face has discrete musculature that can be analyzed. Other modalities of expression, such as the voice and touch, have far coding variables, making them much more difficult to analyze in a standardized way. A third reason is that technology for visual representations of emotions, like photographs and videos, allowed for an early head start into the scientific study of facial expression. Alternatively, creating decoding tests involving vocal or tactile stimuli posed large methodological issues as opposed to showing simple photographs or videos of facial displays. Because of these factors, it is until only recently that we have started to uncover the patterns of other expressive modalities across cultures.

The second most widely-studied modality of emotion-related display is the human voice (Juslin & Laukka 2003; Scherer, 1986). Whereas a first generation of studies of the voice focused on a limited set of emotions – anger, disgust, fear, sadness, surprise, and happiness – more recent studies documented that the voice can communicate more emotions than previously thought (Sauter, et al. 2010). More specifically, in work by Simon-Thomas and colleagues (2009), participants were asked to communicate over 15 different emotions with vocal bursts, that is with brief, non-linguistic sounds. In this study, participants’ vocal bursts of 15 emotions were reliably judged as the intended emotion by a second sample of naïve observers. Sauter and Ekman 2010 performed a two-way cross-cultural vocalization experiment with Himba and UK participants, and the spontaneous vocal bursts collected from both cultures were decoded with above-chance accuracy ratings for joy, anger, disgust, fear, sadness, and surprise.

A third expressive modality that has more recently been discovered to convey discrete emotion is touch. Touch poses the greatest methodological challenge of all, since there are countless coding variables arising from 1) the part of the body delivering the touch; 2) the part of the body receiving the touch; 3) the specific action, pressure, duration, intensity, etc. of the delivered touch; and 4) any coincidental action arising from the person receiving the touch that affects the touch itself. Hertenstein et al. (2009, 2006) were the first to report on touch conveying discrete emotions for the emotions anger, fear, happiness, sadness, disgust, love, gratitude, and sympathy. They also reported on specific patterns of spontaneous touch displays that were used to code and distinguish each tactile expression. There is, however, no current evidence that tactile expressions of emotion are cross-cultural, though I suspect that they will be found for sympathy, fear, anger, and disgust.

Finally, it is important to note that in most studies of expression, single modalities are focused upon (for exceptions, see Campos, et al., 1989). Cross-modal integration of expressive stimuli has a long history of producing additive effects in emotion recognition accuracy (Vroomen, Driver, & de Gelder, 2001; McGurk & MacDonald, 1976; DeGelder and Vroomen, 1995, 2000; Massaro & Egan, 1996; Massaro, 1998). Across these studies, there is agreement for three conclusions: 1) that combining complementary stimuli increase the likelihood of an emotion to be decoded correctly; 2) that combining complementary stimuli make the expression appear more intense; and 3) cross-modal influence is observed even when subjects are instructed to ignore one modality, usually the face. It follows from these studies that there may be an inherent cognitive link between facial, vocal, and likely tactile expressive modalities.

IX. Cultural Approaches

A central controversy in the affective sciences regards the extent to which expressions of emotion are universal (see Ekman, 1971; Elfenbein & Ambady, 2003; Keltner & Lerner, 2010, etc.), culturally constructed (Barrett, et al., 2007; Tsai, 2007; Russell, 1991), or shaped by individual experience and context (Russell, Bachorowski, and Fernandez-Dols, 2002; Solomon, 1993 etc.). It is assumed by some that emotional expressions are discrete, that is, different emotional states are conveyed by distinctly different behavioral patterns. Studies on emotional expression in the face (Ekman, Friesen, Ellsworth, 1972; Matsumoto, 2008), the voice (Simon-Thomas, et al., 2009, Scherer, 1986), touch (Hertenstein, et al., 2006, 2009), and posture (Tracy & Matsumoto, 2008) have documented evidence in support of a discrete set of expressions that convey emotional states. Complexities arise, however, when we look at expressions across cultures and at the individual level. An evolutionary approach to emotion requires that some aspect of expression is conserved across-cultures, but there are other possible explanations for universality (Ekman & Cordaro, 2011). Furthermore, it is easy to observe that not everyone from all cultures expresses emotion in exactly the same way (Solomon, 1993), because cultural norms influence emotional behavior (Scherer & Wallbott, 1994; Panksepp, 2007). Some universal-emotion theorists have argued that our emotional repertoire consists of fundamentally similar, but socially constructed, ways by which we react to universally shared stimuli (Markus & Kitayama, 1994; Averill, 1985; Russell, 1991). In this respect it is ontogeny, not phylogeny, which is responsible for any commonalities in each discrete emotion.

One major criticism of the universal emotion perspective is that context matters (Averill, 1985). For example, the same expressions have been rated as different emotions when participants are given different contextual cues (Barrett, Lindquist, Gendron, 2007). Similarly, research in cross-cultural display rules has found that participants from different cultural backgrounds do not

use the same expressions in response to the same emotional stimuli (Ekman, 1994, Levenson, 2011). Ethnographic work and research on ideal affect define also illustrates how cultural and linguistic context obliges cultural groups to express valued emotional states and suppress devalued emotional states (Lutz, 1987). This is the heart of the debate: How can we justify that cultural and individual contexts matter for expression, but at the same time recognize that some emotional expressions transcend cultural boundaries?

Recent work in emotional expression has since added to the complexity of this controversy as evidence surfaced for "newer" emotional expressions above and beyond anger, fear, surprise, disgust, sadness, and joy. Many of the less-studied expressions, such as awe, embarrassment, or contentment, are reliably signaled using facial, vocal, tactile, and postural cues, but there is little evidence as to whether these expressions are reliably used to signal emotion across cultures. Since the decades-old universal expression studies on the "Ekman 6" emotions, there have to our knowledge been no experimental findings on the extent to which other emotional displays and other modalities have the same cross-cultural robustness as the facial expressions of anger, fear, surprise, disgust, sadness, and joy.

X. The Search for Cultural Variations

As the science of emotional expression has developed, investigators have become increasingly interested in cultural variations in emotional display. These studies most typically have compared participants from different cultures of origin, and documented several kinds of variation in expressive behavior. Matsumoto (1990) and Russell (1991a), for example, demonstrated that cultural context matters in how members of different cultural groups recognize emotional displays. Matsumoto (1989) and Schimmack (1996) also found that people who value individualism above collectivism are more accurate judges of emotional expressions in the face. They posited that members of individualistic cultures value free expression and have more practice judging the emotional displays of people around them.

Another key cultural difference in expression is the level of intensity attributed to facial displays of emotion (Matsumoto & Ekman, 1989). One finding is that participants from America attribute higher intensity overall to facial expressions than do participants from Japan (Biehl et al., 1997; Matsumoto et al., 1999, 2002). Matsumoto (1999) revealed that an assumption of Japanese participants was that expression intensity correlates more directly with inward feeling, where American participants believed that outward expressions were more intense than inward feelings. This is consistent with Matsumoto (1989) and Schimmack's (1996) findings that individualistic values effect how emotional expressions are intensified.

These results inform the findings that people from different cultural groups tend to regulate their expressive behavior according to cultural display rules (Matsumoto et al., 2009, JPSP)_. Cultural values oblige us to up regulate the expression of some emotions and down regulate the expression of others. Emotion regulation is of key importance here, since this is the primary mechanism by which people maintain desired affect. (Tsai, 2007; Scollon, Howard, Caldwell, & Ito, 2009) Tsai, Louie, Chen, & Uchida (2007) found that children as young as five years old have already begun to idealize certain affective states such as contentment in Taiwan and excitement in the USA. Furthermore, cultures develop what might be called cultural variants, which are culturally-informed ways of expressing different emotions (Elfenbein & Ambady, 2002). Emotional displays are rich, complex, coordinated sequences of muscle movements, vocal bursts, postures, and tactile cues.

Cultural differences and social expectations can influence expressive sequences in nuanced ways, producing what have been called "emotion accents" (Hess & Philippot, 2007; Marsh, Elfenbein, & Ambady, 2003) A tongue bite and shoulder shrug, for example, are displays of embarrassment in Southeast Asia that are entirely different from Keltner's (1995) embarrassment displays. This does not mean, however, that people from Southeast Asia do not sometimes avert their gaze, perform controlled smiles, and cover their faces when feeling embarrassed. The tongue bite/shoulder shrug is one of a few variants or alternate displays of embarrassment to Southeast Asians (Haidt & Keltner, 1999) .

Lastly, cultural values studies have suggested that more collectivist participants make greater use of environmental context when interpreting emotional displays; participants with more individualist values tend to rely primarily on the expression they see. Masuda, Ellsworth, Mesquita, Leu, and van de Veerdonk (2004) showed that Japanese participants' interpretations of an emotional facial expression depended largely on the facial expressions of figures in the background of the central image. American participants, however, tended to rely primarily on the central facial expression, not the background context, when decoding the target expression. Based on such findings, Barrett, Mesquita, and Gendron (2011) claim that context is critical to the emotional decoding and encoding process.

In the present investigation, we significantly expand upon the understanding of cultural variations in emotional display. In particular, by FACS coding such a wide array of emotional displays, we uncovered hundreds of systematic cultural variants in facial muscle movements across five cultures and 22 different emotion concepts. It is some of the first evidence on cultural variations in emotional behavior across China, India, Korea, Japan, and USA, and our approach captures systematic cultural differences in previously unstudied emotions. Lastly, and most notably, these data provide evidence for a broader perspective of emotional expression across cultures - one that does not concede to either the evolution or cultural-constructivism perspectives, but rather provides evidence for both. These data lead us to conclude that understanding the sum total of expressions across cultures requires three layers: 1) universal tendencies; 2) cultural differences; and 3) individual difference and nuance. This experiment for the first time provides holistic evidence for these three layers.

XI. The Present Research

The present research expands upon the past 150 years of emotion science by documenting expressive displays of emotions not systematically studied, as well as cultural variations in emotional expression in five cultures. In Study One (XII) we collected and FACS coded over 5500 free-response facial and body displays of emotion as part of an emotion expression production study of 22 emotion concepts in China, India, Japan, Korea, and the USA. Participants demonstrated nonverbal displays of emotion in response to stories representing these as 22 concepts. Our analyses reveal common core patterns of expressive behavior for each state, extensive cultural variation across all 5 cultures, and systematic individual differences in expressive style. To our knowledge, this is the most extensive study to date aiming to test the cross-cultural encoding hypothesis, which seeks commonalities in emotional expression across cultures (Ekman & Friesen, 1981). These data expose patterns in 13 emotions not previously considered "basic emotions"; they also expose significant cultural and individual variations in the well-studied "basic emotions". The results of this study offer new display patterns for 22 emotion concepts displayed by five different cultures on two continents.

In Study Two (XIII) we tested the universal recognition of 13 facial expressions and 17 nonverbal vocal expressions that have been documented in previous studies to covary with the experience of distinct emotion in ten nations representing five continents. Recognition data revealed universality from Chinese, German, Indian, Japanese, Korean, New Zealander, Pakistani, Polish, Turkish, and American participants supported the hypothesis that there may be at least nine additional universally-recognized facial expressions above and beyond the traditionally studied emotions of anger, anger, disgust, fear, happiness, sadness, and surprise. Additionally there may be at least 16 universally-recognized nonverbal vocal expressions of emotion. Participants demonstrated their ability to match stills of facial expressions and clips of audio expressions to emotional stories representing 22 different emotional contexts. Our analyses reveal 25 new potential candidate expressions for universality, though there were strong cultural differences in recognition ratings. We conclude that there are likely more than six universal expressions of emotion, and that universal expressions are not limited to just the face.

Expressions and Emotions. These studies aim to answer the question "are there more than six universal *expressions* across cultures?" They do not, on the other hand, seek to identify which states are universal *emotions* across cultures. It is important to disambiguate the terms expression and emotion, because they are sometimes used interchangeably in studies on emotional expression (see Ekman & Friesen, 1975 and Keltner, 1995). The definition of *emotion* is a topic of intense debate in the emotion literature (Parkinson, 1996), while the definition of *expression* is simply any action that conveys a mutually-understood message. Expressions may be thought of as consequences of emotions that can be used to convey internal states to others, however it is important to note that not all expressions come from emotional events (Russell, 1994). There are many nonverbal expressions that may arise from non-emotional psychological states, and in this study we seek to determine the extent to which nonverbal expressions transcend cultures. Whether the expressions we studied were due to emotional events depends on how one defines what it means to be an "emotion". A central theme in emotion psychology is that emotional expressions can be universal, however it is important to distinguish between what is meant by "emotion" and "expression". In the emotion literature, there are dozens of interpretations of what exactly it means by calling a response "emotion" and distinguishing emotions from other cognitive or physiological states; despite this, one generally-accepted definition of an emotion might be "a brief, multi-component response to challenges and opportunities that are important to the individual's goals" (Oatley, Keltner, & Jenkins, 2006).

Other important theoretical frameworks attempt to capture the defining nuance of emotional experiences, and one fundamental approach is known as *basic emotion theory*. The adjective "basic," when used to describe emotions, embodies two main characteristics (for a review see Ekman & Cordaro, 2011). One of these is that the emotions are discrete, that they can be distinguished fundamentally from one another. The second characteristic embodied in the adjective "basic" is the view that emotions have evolved through adaptation to our surroundings. According to basic emotion theory, an emotion is either basic, or it is another affective phenomenon saturated with but different from the emotions. These can range from moods, to emotional traits, disorders, and cognitive states. Basic emotion theory captures what is unique about emotion, and what emotions have in common that distinguish them from other affective states (Ekman, 1972). This theory specifically outlines thirteen criteria (see Ekman & Davidson, 1994) that must be present in order to call an phenomenon "emotion": 1) distinctive universal signals; 2) distinctive physiology; 3) automatic appraisal; 4) distinctive antecedent events; 5) presence in other primates; 6) capable of quick onset; 7) can be brief duration; 8) unbidden

occurrence; 9) distinctive thoughts, memories, and images; 10) distinctive subjective experience; 11) cognition filters information available to what supports emotion; 12) unconstrained target of emotion; 13) can be enacted in either constructive or destructive fashion. Rigid definitions, as exemplified by basic emotion theory, limit the possibilities to about six states that can fulfill the rigorous requirements of what it means to be an emotion (Shiota, Campos, & Keltner, 2006). One of these is that the expression can be recognized across all cultures, and that no matter where the expression is encoded, it will be decoded with high accuracy. A universal expression may have some variation across cultures, but can always be recognized at least at above-chance rates globally (Russell, 1994). The data for universal emotions includes facial, vocal, tactile, physiological, and narrative.

In the studies that follow, we tested the extent to which 22 emotion concepts can be conveyed in nonverbal expressions across cultures. We use the term "emotion concept", because these studies do not test whether these states pass the various definitions for what it means to be an emotion. Testing whether the 22 states are emotions, for example, in accordance with the thirteen basic emotion criteria would take several lifetimes of work. We therefore restricted our work to studying *potentially universal* nonverbal expressions of states that *may be emotions*. We begin looking into this question by first identifying how five different cultures express the 22 emotion concepts in the face, using dynamic video recordings of spontaneously-generated behaviors in response to stories. We then observe how over 500 people representing 10 different countries recognize facial and vocal expressions for the same 22 emotion concepts. We conclude that there may be at least 30 universal expressions across the ten cultures, and that universal expressions are not limited to the face alone.

XII. Study One: New Emotion Display Patterns and Differences Across Five Cultures

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Abstract. In the study of emotional expression, strong evidence exists in support of both universal displays and cultural variations in emotional expression. We collected and FACS coded over 5500 free-response facial and body displays of emotion as part of an emotion expression production study of 22 emotion concepts in China, India, Japan, Korea, and the USA. We focused on states that have been studied in the literature on emotional expression. Participants demonstrated nonverbal displays of emotion in response to stories representing these 22 concepts. Our analyses reveal common core patterns of expressive behavior for each state, extensive cultural variation across all 5 cultures, and systematic individual differences in expressive style.

Overview. In a first study, participants heard stories associated with 22 emotion concepts, and were told to freely engage in expressive behavior appropriate to that concept. The free-response expressions were recorded on an HD camera, and the behaviors of each expression were coded using the Facial Action Coding System (Ekman & Friesen, 1977) and an empirically based coding system that identified other gross behavioral observations specific to each emotion, such as posture, breathing, and hand/arm movements. We analyzed the patterns of each individual behavior within and between emotions, and within and between cultures. Systematic patterns and differences of these behaviors are reported herein.

It is important to note that this study involves voluntarily produced emotional behavior, rather than spontaneous reactions to emotional stimuli. We hypothesized that despite individual and cultural differences, we would observe systematic between-culture patterns of facial action units by emotion. A second hypothesis was that for the well-studied basic emotions anger, contempt, disgust, fear, happiness, sadness, and surprise, we would observe archetypal display patterns (Ekman & Rosenberg, 1997). For example, under our second hypothesis, the core action unit pattern for anger should include brow furrowing, eyelids tensed and raised, and lips tightened and pressed together (4+5+7+17+23+24). The core action units for happiness should include a prototypical Duchenne display (6+7+12), and so on.

Overview of Methods. 120 participants in 5 cultures were asked to express emotion in response to 23 stories read by natives of each culture. Their responses were recorded in HD and coded using the Facial Action Coding System (FACS) and gross body movement coding. The frequency of the behavior codes were analyzed against chance across the five cultures.

Emotion Stories. We chose emotion stories as our stimuli for eliciting expressive responses from our participants (Dashiell, 1927; Ekman & Friesen, 2003). The stories were selected on the basis of four criteria: 1) *conciseness* – all stories were one sentence long; 2) *simplicity* – the stories described generalized, fundamental life events 3) *thematic universality* – the stories centered upon events likely to occur in all cultures; and 4) *affectively targeted* – each narrative contained the target emotion word in either noun or adjective form. Guided by these criteria, we used stories for the Ekman 7 emotions from a previous cross-cultural study of vocal bursts (Sauter, Eisner, Ekman, Scott, 2010). The remainder of the stories were written by the experimenters, using these as model. Table 4 presents the emotions of interest and the stories we used to elicit expressive behavior in the five cultures.

Table 4.
Emotion words and stories used for each emotion in Study One.

English	Emotion Story
Amused	**Your friend just told you a very funny story, and you are very amused by it.**
Angry	**You have been insulted, and you are very angry about it.**
Awe	**You see the biggest waterfall in the world for the first time, and you are awed by how enormous and powerful it is.**
Bored	**You have been waiting for a long time with nothing to do, and you feel very bored.**
Confused	**Something is difficult to understand, and you feel very confused about it.**

Contempt	**You see a wealthy person throwing expensive clothing into the garbage, and you feel contempt over such a wasteful act.**
Content	**You have been resting comfortably on a peaceful day, and you feel contented.**
Coy	**You are flirting shyly with someone across the room, because you are feeling coy.**
Desire	**You are hungry and see some delicious food that you desire.** **You see someone who is very sexually attractive, and you feel a strong desire to have sex with them.**
Disgust	**You have just eaten some rotten food and feel very disgusted.**
Embarrassed	**You had been passionately singing your favorite song until you realized your friends were watching, and now you feel embarrassed.**
Fear	**You are suddenly faced with a dangerous animal and feel very afraid.**
Happiness	**You have just met your friend and feel very happy that your friend is here.**
Interested	**You are learning some useful information which you find very interesting.**
Pain	**You just hit your leg on a rock, and it feels painful.**
Pride	**You just achieved great honor for yourself and your country, and you feel a great sense of pride.**
Relief	**You have just escaped a dangerous situation and feel very relieved that you were not harmed.**
Sadness	**Your cousin has just died, and you feel very sad.**
Shame	**You have been caught doing something that is disgraceful to yourself and to your family, and you feel very ashamed.**

Surprise	**You see a bright light in the middle of the night and are very surprised.**
Sympathy	**You see someone with an injury, and you feel sympathy for them.**
Triumph	**You have just won a very challenging competition and feel triumphant.**

Translations. We used a three-step process to translate the stories into four target languages: Japanese, Kannada, Korean, and Chinese (Li, L., Wang, H.M., Shen, Y., 2002). We worked exclusively with translators for whom English and the target were both primary languages, and these translators wrote the initial target language-versions of the stories. The translators were instructed to stay as true as possible to the English original, but the final version had to sound like a target-language original phrase. Specifically, the translators were free to make minor changes to grammar and syntax, but not to the content of the original message. In a second round, two new bilingual native speakers backtranslated the first translation into English. These second-round translators were naïve to the English original, and the two backtranslations were compared to each other and to the original to identify linguistic inaccuracies. We discussed the inaccuracies with all three translators until we achieved unanimous agreement on ideal word choice and phrasing.

Participants. Participants were notified through email, in person, or through online social networks that an in-person experiment would take place that tested their ability to produce spontaneous emotions in response to short stories. Participants were selected within each culture if they 1) had no more than one month self-reported total exposure to an outside culture in their lifetime, as defined by self-reported travel time spent in other countries; 2) could speak the native language fluently; 3) had no prior coursework in emotion; and 4) were between the ages of 18-30. Participants were compensated with small gifts of appreciation, such as notebooks, pens, and clothing printed with their university seal. All participants were either university students or affiliates. All of our Korean sample was taken from a subset of students at Peking University in Beijing, who had all arrived no later than one week prior to the experiment. Though they had been in China for one week, this group of participants showed clear and unique systematic within-culture differences in expression as compared to Chinese students. Japanese students were recruited through Osaka University, Kyoto University, and the University of Tokyo. Indian students were recruited through Karnatak University of Dharwad.

Recording Sessions. Participants were seated in a plain room with white walls approximately 6 feet away from an HD video camera mounted to a tripod and amplified with a shotgun microphone. Only three people were present for each trial: the participant, the translator, and the lead investigator (DC). The lead investigator worked the camera and only spoke a single indicator word in a neutral tone (“good”, “ok”, “next”, etc.) when each expression was caught on camera, regardless of what the expression was. The primary person the participant had contact with, the translator, was a native speaker of the target language, fluent in English, and was trained to read each story at the same pace and in a neutral tone of voice. The reader explained to each participant that they were to demonstrate nonverbal facial and vocal expressions of emotion inresponse to the events in the stories, as if the events were happening to them. Participants could repeat any expression until they felt it was expressed properly. They were encouraged to think of a facial and/or vocal expression for each story, but were not required to do so if they could not

think of one that they would use. Participants were then demonstrated their expressive behavior after the story was read. The participants were told to skip any stories that made them feel uncomfortable or distressed, but this only happened on three emotion trials (one female USA shame display; two female Indian sadness displays). Participants took an average of 8 seconds to demonstrate their expressions, and rested for a minimum of 10 seconds before starting the routine to enact the subsequent display.

Coding and Selection. We cropped each participant's portrayal of the 22 emotion concepts into isolated video clips that captured the onset, apex, and offset of each response, giving us a total of 5,459 expressions across five cultures. Each expression was coded at apex using the Facial Action Coding System, which is a muscle-by-muscle annotation technique for recording all visible movements in the adult human face (Ekman & Friesen, 1978; Gosselin, Kirouac, & Dore, 1995). A main coder with over a year of experience working with FACS identified the muscle actions present at apex for each spontaneous expression, and seven other coders scored a random subset equaling 20% of these total videos. Once apexes were agreed upon, average reliability scores on AUs ranged from 0.72-0.84. The apex was defined as the point of peak intensity for a collection of action units in an emotional expression. We coded all expressions in clips containing multiple apexes. In the final analysis, however, we included only the expressions that represented the participants' first response right after the story was read. For expressions with multiple apexes, we analyzed only the single most representative apex for a given expression, which was defined as the longest-held combination of AUs. After applying these selection criteria, we analyzed 2,640 of the total collection of 5,459 coded expressions. This equates to one criterion-selected apex per participant per emotion story.

We also used a few rules specific to the data set. The FACS manual describes "A-level" head and eye movements in stills as "unscorable". Since we were using HD video and could easily see slight head and eye deviations from center, we coded these movements at the A-level as they arose. A second modification was the decision to collapse AUs 26 (jaw dropped, relaxed) and 27 (jaw actively stretched) into a single code called "Jaw". Due to individual differences in physiognomy, we found it to be a subjective decision whether or not participants' jaws were maximally relaxed (AU 26) or minimally active (AU 27), so for the purposes of this study, we did not distinguish between the two. Our third modification was the addition of "write-in actions", which are any noteworthy bodily movements that FACS does not account for. Based on an initial review of the videotapes, we had coders note when the following occurred in this write in category: specific arm motions, breathing patterns, leaning behaviors, and uniquely individual facial muscle actions that do not have a FACS code. Write-in actions were not included in the reliability scoring procedure, since the number of degrees of freedom in potential observations is high. Instead, we agreed upon a standard notation for key actions, and calculated binomial reliability on the basis of whether two coders agreed that the write-in action was present or not. Since key write-in actions were much less subtle than facial action units, agreement was 1.0 for all of them. Subtler write-in actions for which perfect agreement could not be established were not included in the final analysis.

Chance. One argument is that these data are the result of random, albeit extremely fortunate, chance firings of action units. In setting a chance threshold, it is important to note that there are over 60 facial action units we used to code these expressions. In the most liberal sense, we could use a 1/60 chance threshold, but the significance data would not be meaningful. This is because given our sample sizes, we would need to see an action unit only three times to be considered "significant" against a 1/60 chance threshold.

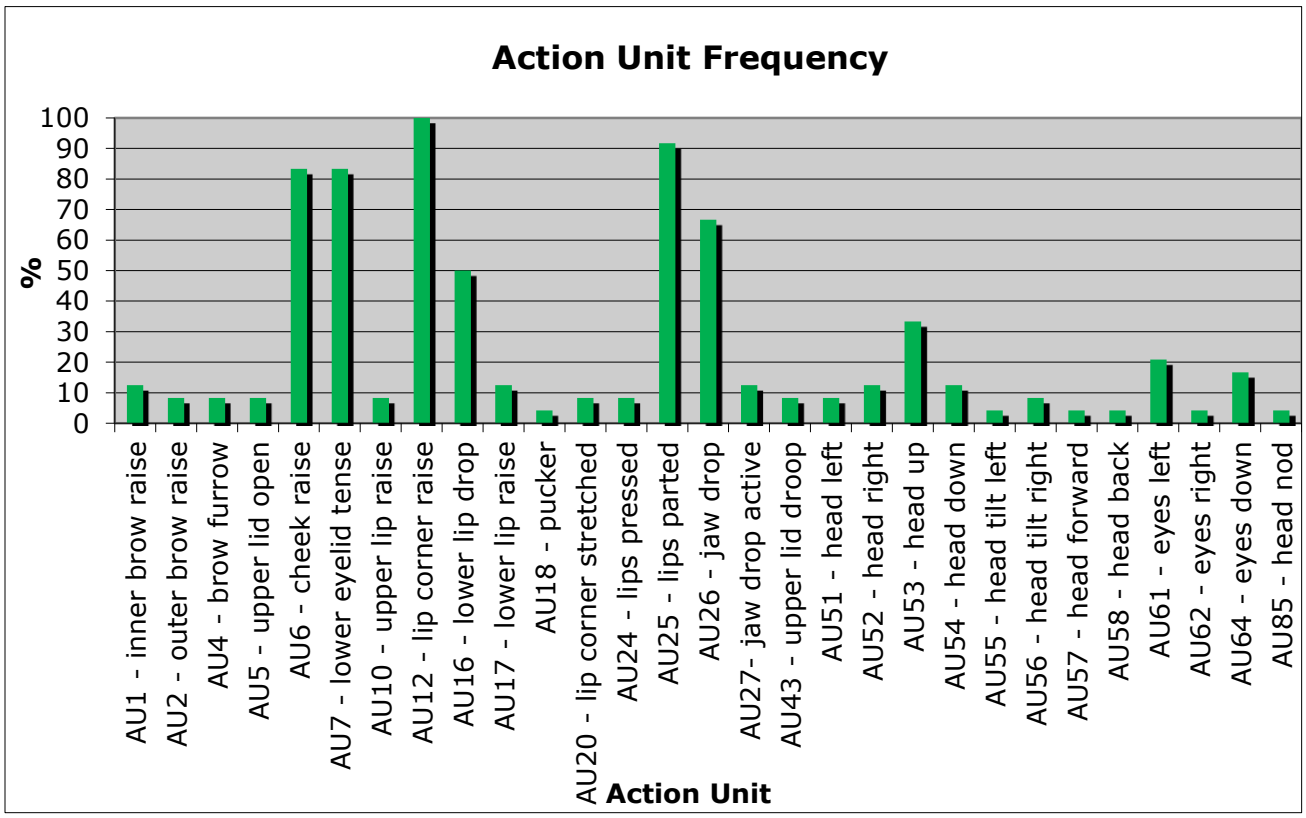
Given this, we decided to use a much more stringent chance rate based on the groupings of action units from the Facial Action Coding System Manual. The FACS manual divides the human face into groupings of action units based on the region of the face. The upper face has only six common action units, which is the smallest group of any facial region. This means that the most stringent possible chance rate for any region of the human face is 1/6; we chose this extremely conservative threshold to represent the entire face. Therefore in this study, we interpret any action unit that occurs significantly above 1/6 as behavioral pattern for that emotion. Any action unit that does not occur significantly above the 1/6 threshold is interpreted as having been due to chance.

Results and Discussion Overview. The present investigation is interested in uncovering the universal patterns and cultural variations in expressive behavior across 22 emotion concepts. To examine universals, we identify what we will call core sequences of action units (AUs) according to the frequency with which the AUs appear across cultures. AUs that appear at above-chance rates in all cultures are part of the 'core sequence', which is a collection of expressive behaviors that are candidates for a universal pattern. AUs that appear at above-chance rates in individual cultures are said to be 'cultural variations' and not universal. Using this method, we identified a core sequence for each of 22 emotion concepts, as well as hundreds of cultural variations.

Controlling for gender differences. One argument is that within-culture action unit patterns could be driven by gender differences and not by truly ubiquitous cultural effects. Using Chi-squared analysis, we identified all significant gender differences by action unit, culture, and emotion. For those action units that had significant gender differences, we further compared the observed nonparametric binary probability by gender against the hypothesized 16.7% chance rate to identify whether males and females separately expressed the action unit at above-chance rates. In cases where one gender did not express the action unit at statistically significant levels, the action unit was removed from consideration as a possible universal pattern for that emotion. These action units are, however, reported in Table 7: Action unit codes representing hundreds of cultural variations for 22 emotion concepts. In this table, we indicate action units that were only present for one gender as superscript "M" for male and "F" for female.

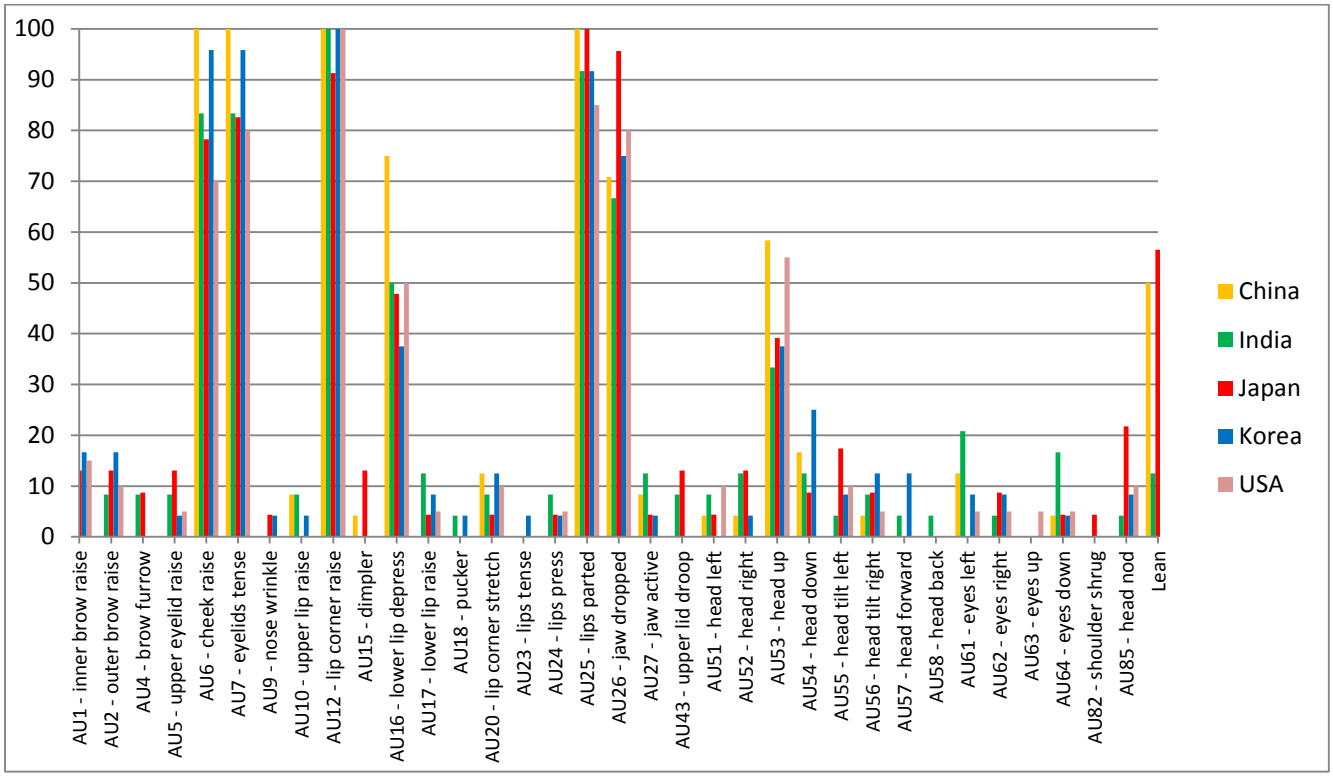
Analysis of Action Unit Patterns. After distilling each video clip into its constituent Facial Action Units, we calculated the frequency distribution for each action unit, collapsing across all nations and for the 22 emotion concepts. We then looked at the frequency of action units by culture, as represented in Figure 1: India Amusement (N=26 expressions). In this figure, there are seven action units that appeared at statistically above-chance (16.7%) rates. Those are AUs 6, 7, 12, 16, 25, 26, and 53, which physiologically represent an open-mouthed Duchenne smile, with a jaw drop, and head tilted back. These seven action units represent the facial behaviors that our Indian participants used most frequently when primed with our amusement story.

Figure 1: Action Unit frequency distribution for India Amusement



After producing 110 similar distributions for each story by culture, we collapsed each distribution by story as exemplified in Figure 2: Amusement in Five Cultures. This is a composite frequency distribution of the most frequently coded action units across all five cultures. The action units that were displayed at above-chance rates across all cultures were again 6, 7, 12, 16, 25, 26/27, and 53. This series of seven "core" action units that appear across cultures might be called an "international core sequence". In this figure we also see two cultures, China and Japan, whose participants leaned in their chair with higher frequency than the other three nations. The behavior of leaning, which appears in at least one but not all cultures, may be called a "cultural variation". The action units that were neither a part of the international core sequence nor cultural variations were simply individual differences in expressive behaviors that varied from participant to participant.

Figure 2: Action Unit percent frequency distribution for Amusement in Five Cultures.



Action Unit Patterns. There were three overall patterns that arose as a result of the action unit frequency analysis: 1) *core sequences* – action units appearing at above-chance frequency across all cultures; 2) *cultural variants* – action units appearing at above-chance frequency within at least one, but not all cultures; 3) *individual differences* – action units appearing at below-chance frequency and without universal or cultural patterning. All three of these patterns are illustrated in Figure 2: Amusement in Five Cultures. Core sequence units included 6, 7, 12, 16, 25, Jaw, 53 (eyes contracted, smiling, lower lip depressed, lips parted, jaw dropped, and head back, respectively). There was a cultural variant of leaning behavior for Chinese and Japanese participants that was not present for Indian, Korean, and US participants. The remaining action units that did not appear at above-chance rates are due to individual differences and to random chance. An example frequency distribution is found in Figure 2, which displays the AU patterns for N=24 Indian amusement expressions.

In order to determine whether action units appeared at statistically significant rates within each culture, we compared each observed action unit frequency against a hypothesized 16.7% chance rate using a nonparametric binomial test. Action units that were statistically significant across all cultures within the same emotion story category were considered a part of what might be called an "international core sequence" (Table 5). In Table 5, reliability scores refer to how reliably, on average, each international core sequence predicts participants' spontaneous expressions. To calculate this, we used the standard FACS reliability scoring equation for interrater reliability between two coders (Ekman & Friesen, 1972). Specifically, FACS interrater reliability requires summing the number of times two coders agree on the presence of action units, and multiplying that number by two (numerator). Secondly, the total number of action units scored by

both coders is the denominator. The equation is written as follows: reliability = $\frac{2(number\ of\ agreements\ between\ two\ coders)}{total\ number\ AUs\ scored\ by\ both\ coders}$.

Table 5.
International core sequences, physical descriptions, and reliability scores for each sequence.

'Emotion'	International Core Sequence	Physical description	Reliability
Amusement	**6+7+12+16+25+Jaw+53**	**Duchenne smile, lower lip & jaw dropped, lips parted, head up**	**0.76**
Happiness	**6+7+12+16+25+Jaw**	**Duchenne smile, lower lip and jaw dropped, lips parted**	**0.72**
Surprise	**1+2+5+25+Jaw**	**Eyebrows raised, upper eyelid raised, lips parted, jaw dropped**	**0.71**
Triumph	**6+7+12+25+Jaw+FistAir**	**Duchenne smile, lips parted, jaw dropped, fist(s) raised in the air**	**0.70**
Awe	**1+2+5+12+25+Jaw+53**	**Eyebrows raised, upper eyelids raised, smile, jaw dropped, head up**	**0.69**
Pain	**4+6+7+20+25+43+HeadU/D**	**Brows furrowed, eyes tightly closed, lips stretched and parted, head up or down**	**0.67**
Embarrassment	**6+7+12+25+54+ControlSmile**	**Duchenne smile, lips parted, head down, smile accompanied by a second modifying action unit**	**0.60**
Relief	**12+18+25+Jaw+43+HeadU/D+Breath**	**Smile, lips puckered and apart, jaw dropped, eyelids drooping, head up or down, audible/visible exhalation**	**0.58**
Coyness	**6+7+12+25+54**	**Duchenne smile, lips parted, head down**	**0.58**
Fear	**1+2+5+7+25+Jaw+MoveBack**	**Eyebrows raised, upper eyelid raised,**	**0.56**

		eyelids tight, lips parted, jaw dropped, bodily movement backwards	
Disgust	**4+6+7+9+10+25+Jaw**	**Brows furrowed, outer eyes contracted, eyelids narrowed, nose wrinkled, upper lip raised, lips parted, jaw dropped**	**0.54**
Desire Food	**7+12+25+Jaw**	**Eyelids tight, smile, jaw dropped**	**0.48**
Contentment	**12+43+DeepBreath**	**Smile, eyelids drooping, audible/visible breath in and out**	**0.46**
Pain	**4+6+7+20+25+43+HeadU/D**	**Brows furrowed, outer eyes contracted, eyelids tight,**	**0.45**
Desire Sex	**6+7+12+25**	**Outer eyes contracted, eyelids tight, smile, lips parted**	**0.41**
Sadness	**4+43+54**	**Brows furrowed, eyelids drooping, head down**	**0.39**
Confused	**4+7+HeadTiltL/R**	**Brows furrowed, eyelids narrowed, head tilted**	**0.38**
Shame	**4+17+54**	**Brows furrowed, lower lip raised, head down**	**0.38**
Contempt	**4+14+25**	**Brows furrowed, lip corner(s) tight, lips parted**	**0.30**
Sympathy	**25+Jaw+57**	**Lips parted, jaw dropped, head forward**	**0.28**
Boredom	**43+HeadU/D**	**Eyelids drooping, head up or down**	**0.28**
Anger	**4+7**	**Brows furrowed, eyelids tight**	**0.23**
Interest	**85**	**Head nod**	**0.22**

Cultural Variations. Action units that occurred with above chance likelihood in some cultures but not all five cultures were considered "cultural variations" for those particular cultures.

Frequency Analysis of Action Units. Not surprisingly, AUs 25 (lips parted; N=1649) and our collapsed action "Jaw" (N=1326) appeared in the top three most frequent actions, since many of our participants used open-mouthed displays to convey emotion. Action unit 12 (N=1334), the smile, appeared second-most frequently and was found in 10 out of 22 international core sequences, nine of which are positively valenced. It is often cited (e.g. Soussignan, 2002; Williams, et al., 2001; Ekman, Davidson, and Friesen, 1990; Surakka and Heitanen, 1998) that there are two pleasurable displays of emotion: the Duchenne and polite smiles, which can be distinguished by the presence of AUs 6+7 in the Duchenne display. Our data indicate that the "Duchenne" pattern 6+7+12 appears across cultures for the positively-valenced stories of *amusement, awe, coyness, desire (sex), happiness, and triumph*. The "Duchenne" 6+7+12 pattern also appears for the negatively-valenced story for *embarrassment*. These data suggest there are likely more than just "happy" and "polite" states of enjoyment, and that these additional pleasurable states are highly nuanced and expressively different from one another.

Low AU frequency did not betray low importance or non-uniqueness. On the contrary, low-frequency action units such as 14 (lip corner tightener; N=259), 18 (lip pucker N=278), and 85 (head nod N=226) appeared exclusively in the international core sequences of contempt, relief, and interest, respectively. Write-in actions also played a role in distinguishing between expressive states across cultures. Participants displaying contentment frequently took a deep breath in, held it for a moment, and released before relaxing. This was coded as a "deep breath" and appeared as a core action along with 12+43 in the contentment sequence. Participants expressing *relief* displayed a different kind of breathing pattern, coded as "breath". This write-in was marked by a breath in, followed by a forced breath out, usually through puckered and/or funneled lips and often accompanied by a nonverbal sound. The triumph write-in action "fist air" was a near-unanimous display of holding one or two clenched fists above the level of the solarplexus. Lastly, the embarrassment write-in "control smile" represents any AU combination 12+X, where X is one or more action units that dampen the smile, such as 14, 15, 17, 23, 24, etc.

International Core Sequences. Action units that survived the nonparametric binomial comparison against our conservative 16.7% chance threshold within all five cultures, and that also showed no significant gender differences were added to the international core sequence table (Table 5). The international core sequences are collections of action units that are used across cultures and are predictive of individual sets of emotions. Though all 22 emotion stories have international core units, they all vary in complexity. For example, *amusement, awe, disgust, fear, pain,* and *relief* all contain seven international core actions and comprise the most complex set of expressions in these studies. *Interest*, in contrast, has the least complex international core sequence (85, head nod) and has large variability across cultures. We also looked at how reliably each core sequence predicted participants' expressions within each emotion. Reliability scores for the international core sequences were calculated using the standard FACS interrater reliability formula and averaging the scores compared to each participants' apex code. *Amusement, happiness,* and *surprise* were the three most well-conserved international sequences, each explaining on average over 70% of participants' expressions. On the other hand, *contempt, sympathy, anger, boredom,* and *interest* core sequences were the least predictive of participants' expressions with under 30% average overlap. Interestingly, not all of the Ekman 7 expressions were highly complex and well-conserved across cultures. The international core sequences for *anger, sadness,* and *contempt* did

not represent what is classically described in the literature as the archetypal displays of these three emotions. In fact, *anger* and *sadness* had some of the widest cultural and within-emotion variability of all the states we studied. These data suggest that "universality" of expression may lie on a continuum, where some expressions are far more conserved than others (e.g., Haidt & Keltner, 1999). An example of a frequency distribution for amusement in five cultures (N=120 expressions) can be found in Table 3.

In total we found 104 cultural variant sequences above and beyond each international core sequence (Tables 6, 7). Here are some illustrations. Participants from the USA tilted their heads when they expressed happiness; Asian participants did not. When demonstrating desire for sex, participants in all nations but India either puckered, bit, or licked their lips. USA participants stuck their tongue out when showing disgust; Chinese participants did not. Embarrassed participants from Japan covered their faces with their hands, while Americans pouted, and Chinese participants pressed their lips together. Table 6 demonstrates two additional cultural variations of hundreds, while table 7 summarizes the action unit codes for every cultural variation by emotion and culture.

Table 6.

Two examples of cultural variations for the emotions embarrassment and sadness.

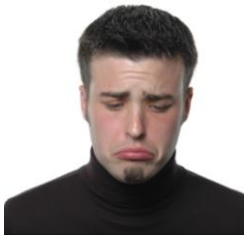
Emotion	International core	Example 1	Example 2
Embarrassment	Eyes contracted, control smile, head down	 China: lips pressed	 Japan: face touch
Sadness	Brows furrowed, eyelids drooping, head down	 Korea/USA: lip corners downturned, lower lip raised	 India/Japan: hand covers face

Table 7.
Action unit codes representing hundreds of cultural variations for 22 emotion concepts. Action units displayed by males only are indicated with superscript "M"; action units displayed by females only are indicated with superscript "F".

Emotion	China	India	Japan	Korea	USA
Amusement	LeanF&B		LeanF&B		
Anger	17+24	5+17+24+25+Jaw	12+17+24+25+Jaw	25+Jaw+54	5+25
Awe		18+63		7	
Boredom	14+17+24+Jaw+HeadL&R+HeadTiltL&R	25+54+HeadL&R	17+24+25+54	14+17+24+25+54	17+24+25+53+55+EyesL&R+EyesU&D
Confused	25+Jaw	25+Jaw+54+EyesU&D	17+24+25+Jaw+56+ScratchHead	6+25+Jaw+56+EyesL&R	12+17+24
Contempt	17+HeadL&R+EyesL&R+EyesU&D	6+7+9+12+Jaw+43+HeadL&R+EyesU&D	7+12+Jaw	17+Jaw+64	7+17+Jaw+84
Contentment	6+7+25+Jaw+HeadU&D	25^{M}+Jaw^{M}+HeadU&D	24+25+Jaw	6+17	6^{F}+7+17
Coyness	Jaw	43+51+64+HandCovFace+EyeWHead	HeadL&R+EyesL&R+EyesU&D+EyesWHead	64+EyesWHead+ControlSmile	Jaw+51+HeadTiltL&R+EyesL&R+EyesU&D+EyesOpHead
Desire Food	5+64+TripleDisplay	17+19+EyesL&R+EyesU&D+TripleDisplay	5+HeadU&D+EyesU&D	6+TripleDisplay	5+53+61+64

Desire Sex	1+2+Jaw + HeadTilt L&R+ TripleDis play	52+EyesL&R	1+2+18+22+Jaw+ HeadL&R+ EyesL&R+ TripleDisplay	Jaw+Head L&R+ TripleDis play	Jaw+HeadL&R+ 61+TripleDisplay
Disgust	54	1[F]+6+20+43+54+6 4+HeadL&R	17+54+LeanF	12+17+54	19
Embarrassed	17+24+J aw+ EyesL& R	Jaw+64+ HeadL&R	Jaw+CoverFace	Jaw+Face Cover[F]	1+17+20[F]
Fear	4+12+16 +20+25+ 52+54+ EyesL& R	16+18	4+12[F]+16+20+54	4+6+12	4+12+16+20+21
Happiness					HeadTiltL&R
Interest	1+2+12+ 17+25+ Jaw+54+ 64	5+17+25+Jaw+ 57	12+18+25+Jaw	1+2+5+12 +17+ 18+25+Ja w	4+7+12+17+24
Pain	12+16+J aw+54	10+16+Jaw+54	9+16[M]+54	9+Jaw+54	9+10+12+16+21+ Jaw
Pride	6+17+25	6+17+25+Jaw+ HeadTiltL&R	6+17+24+85[F] ChestOut	6+17+24+ 85	6[F]+25+64+Chest Out
Relief	22+Slouc h[F]	1+2+22+Slouch+ HandtoChest	6+7+16+(54)+ Slouch	22+Handt oChest	22
Sadness	14+17+6 4	1+6[M]+7[M]+17+25+ HandFace	6+7+25+64+ HandFace	6+7+15+1 7+25+ Jaw+64	15+17+64
Shame	14+43+6 4	6+25+43+84+ HeadL&R+ EyesU&D+ HandFace	6+7+25+Jaw+ HandFace	25+Jaw+6 4	24+64+ HeadU&D

Surprise	53	12+53+HeadL&R	12+53	HeadU&D	4
Sympathy	4^{F}+17+64+HeadL&R	51+64	4+7+12^{F}+17+64+85+HeadL&R	15+17+24+64	1+4+7^{M}+17+HeadTiltL&R
Triumph	16+HeadL&R+HeadU&D	16+43^{M}+53+HeadL&R	HeadU&D		53^{M}+HeadU&D

Reliability scoring for cultural variants. In Table 8, reliability scores refer to how reliably, on average, each cultural variant sequence predicts participants' spontaneous expressions. Additionaly, table 8 provides the average reliability score when the internal and cultural variant sequences are combined. These values are collapsed across all five cultures. Appendices A.1 through A.5 provide the expanded reliability or 'sequence overlap' scores by culture, emotion, and sequence type. To calculate this, we used the standard FACS reliability scoring equation for interrater reliability between two coders (Ekman & Friesen, 1972). Specifically, FACS interrater reliability requires summing the number of times two coders agree on the presence of action units, and multiplying that number by two (numerator). Secondly, the total number of action units scored by both coders is the denominator. The equation is written as follows: reliability = $\frac{2(number\ of\ agreements\ between\ two\ coders)}{total\ number\ AUs\ scored\ by\ both\ coders}$.

Table 8.
Average reliability or 'sequence overlap' scores for 22 emotion concepts' international, cultural, and combined sequences.

Emotion Concept	International sequence	Cultural sequence	Combined sequences
Amusement	.76	.13	.77
Happiness	.72	.11	.72
Surprise	.69	.17	.71
Triumph	.69	.31	.71
Pain	.68	.30	.75
Awe	.63	.14	.65
Coyness	.59	.13	.63
Relief	.59	.23	.55
Embarrassment	.58	.22	.63
Fear	.54	.29	.61
Disgust	.52	.22	.58
Desire Food	.48	.24	.54
Contentment	.45	.24	.53

Desire Sex	.42	.28	.28
Sadness	.39	.39	.57
Confused	.38	.33	.52
Shame	.37	.38	.54
Contempt	.30	.31	.46
Sympathy	.28	.35	.47
Boredom	.28	.38	.48
Anger	.23	.30	.46
Interest	.21	.46	.53

Design Strengths and Limitations. These data represent only a small glimpse into the wide world of possibilities and future directions for this line of work. Though our procedure is strengthened by a methodically conserved, internally valid approach to collecting emotional expression, it suffers from a lack of external validity. In all cases, participants reported to draw upon "method acting", a type of acting that draws upon real experience to produce a fabricated behavior. All participants reported using the strategy of pretending they were experiencing the story in the present moment, and did their best to represent the expression they may use in the situations given to them. Secondly, we collected true-to-life expressions by giving minimal instructions to participants and allowing them to respond freely using whatever expressive modalities they pleased. This method served us well, because it allowed us to survey a wide breadth of different emotions and other cognitive states, but a clear next step is to dive more deeply into each of these individual states to capture real-life emotional expressions in real time. It would have been impractical and possibly unethical to elicit "real" pain, shame, sadness, fear, anger, disgust, and embarrassment all within the same experiment, especially since these elicitors vary strongly by culture. We leave it to future lines of research to take the next step and individually monitor these states in the real world. More externally valid studies will either confirm or disconfirm the patterns we observed in our method-acting experiment.

Furthermore, our emotion stories by no means illustrate all possible variants of these expressive states. Our data for desire indicates that story context can significantly change participants' patterns of expressions, and so each story likely represents one of many possible variants of the same expressive theme. Similarly, translations can never be exact and will vary in meaning between cultures. It will be an important validation step for a different research team to go through the same translation process and expression collection in one or more of the same cultures we studied. This will be key to supporting our finding that context pools can be internationally conserved and culturally specific. Lastly, further studies should employ the use of automated FACS coding tools, so that no information is lost by coding only apexes. It is our intention in the near future to recode all of our expression videos using a machine coder, and report on agreements and disagreements. Though most automated coding programs to date cannot handle all of the action units that we employed in this experiment, it will be important to compare our data to the action units that can be automatically coded.

Fascinatingly, the patterns we observed in this study lean neither toward basic emotion theory nor to cultural constructivism, but rather to both. We found evidence that contradicts the notion of true universal archetypes, but the same evidence also supports the claim that there are universal features of expression. We also found evidence that supports the notion that culture and context are large determinants of expression, and this same evidence points towards new potential candidates for universal emotional expressions. These findings indicate, perhaps, that there are

hybrid theories yet to be explored and studied that go beyond the theory of context pools, core sequences, and cultural variants. Though we do not make any claim to the evolutionary or cultural origin of the international core sequences, it is vital for future research to test these hypotheses on people who are culturally isolated. Only then can we begin to theorize about the origin of these expressive patterns, if they are found to exist in such cultures. One unfortunately unavoidable limitation with this study is that all participants had exposure to globalized media, which is a major confound for this line of experimentation. Though we may be trending towards a globally expressive society due to these media, it is important to capture cross-cultural similarities and differences now before our nonverbal patterns become further homogenized. We have merely scratched the surface of our understanding of nonverbal emotional expression, and we look forward to further work that seeks to decode the rich and complex universal, cultural, and individual language of human expression.

From Encoding to Decoding. Although research on the nonverbal expression of emotion has played a prominent role throughout psychology during the past fifty years, including an instrumental role in the development of the fields of emotional intelligence (Brackett & Mayer, 2003), evolutionary psychology (Shariff & Tracy, 2011), and organizational psychology (Rafaeli & Sutton, 1987), little research has focused on the extent to which a wide variety of nonverbal expressions in the face and voice are recognized across cultures. Most studies on the cross-cultural recognition of nonverbal expression have focused on only one or two culture comparisons (Jack, et al., 2012). Our Study 1 data revealed that there are consistent, systematic patterns in the facial action behaviors of participants across five different cultures. This implies that there may be sequences of facial/bodily actions that are particularly effective in communicating emotional events around the world. We therefore designed Study Two to test the extent with which nonverbal signals are recognized across a much wider group of participants, spanning ten cultures and four continents.

The behavioral data from Study 1 shows that participants did *not* express emotion in terms of concrete, archetypal displays. On the contrary, there was wide variability across participants and systematic differences across cultures. Upon analyzing patterns among the variability, we also observed systematic patterns of action units, where for each individual emotion story, participants were more likely to activate particular subsets of action units more than others. This indicates that expression is not limited to rigid archetypes, but rather is more fluid across subsets of behaviors. For example, someone responding to a funny story is far more likely, on average, to activate AU 12 (lip corner raiser) than AU 15 (lip corner depressor) – but that does not mean that all people will always activate AU 12 , and never activate AU 15. Our data simply indicated the relative probabilities of behaviors across a large sample of action units, emotions, cultures, and expressions.

What, then, does that mean for studies on the recognition of emotion, since we cannot test every possible combination of AU for recognition rates across all cultures? What if the Ekmanian representation of "anger" included action units that were not part of the core sequence, or excluded action units that were? It is possible that the original studies on the universality of six "basic" emotions relied on the assumption that archetypal displays were the best representations of emotion expressions. Furthermore, what if there are more than just six universal expressions of emotion, and what if universal nonverbal expressions are not limited to just the face? In Study 2, we sought to address these issues by presenting participants in ten cultures with still photos and nonverbal acoustic bursts of emotional expressions. In this study, we relied on our best approximations for which AU combinations represent the "most probable display" for each

emotion. We also incorporated some new stimuli from previous studies on the acoustic properties of nonverbal vocal expressions of emotion. Based on the findings from Study 1, the central question in Study 2 was: "Can participants across-cultures recognize more than just six expressions of emotion?"

XIII. Study Two: Pan-Cultural Evidence for 25 New Facial and Vocal Expressions of Emotion Across Ten Cultures

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Abstract. Building upon previous studies, we tested the universal recognition of 13 facial expressions and 17 nonverbal vocal expressions that have been documented in previous studies to covary with the experience of distinct emotion in ten nations representing five continents. Participants were asked to match stills of facial expressions and clips of audio expressions to emotional stories representing 22 different emotional contexts. Recognition data revealed universality in emotion recognition of nine new facial displays and 16 new vocal displays in the judgments of participants from China,, Germany, India, Japan, Korea, New Zealand, Pakistan, Poland, Turkey, and America participants[1]. We also observed strong cultural differences in recognition ratings. We conclude that there are likely more than six universal expressions of emotion, and that universal expressions are not limited to just the face.

Study 2a: Facial Expression Decoding in Ten Cultures

Overview. In a ten-culture expression-decoding experiment, we tested participants' abilities to identify still photographs of emotional expressions. The ten participating cultures were China, Germany, India, Japan, Korea, New Zealand, Pakistan, Poland, Turkey, and USA. Participants read simple, one-sentence stories written in their native language that depicted typical situations that would elicit a specific emotion. Participants were required to choose from a selection of four photographs the one that best matched the emotion scenario. If none of the photos matched the story, the participant could choose the option "none of these" (Frank et al., 1993; Haidt & Keltner, 1999). Each response set included the target emotion and three randomly drawn emotion expressions selected from our pool of expressions. For purposes of generating more stringent recognition data, alternative expressions were of the same valence as the target emotion. In addition, one alternative was always included in the response set that most closely resembled the focal emotion (e.g., disgust for anger).

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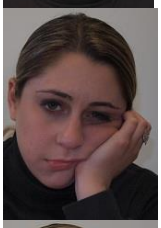
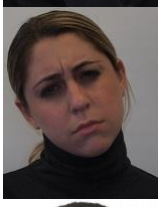
The present investigation was guided by three central hypotheses. A first was that the emotions amusement, boredom, confusion, contentment, coyness, desire, embarrassed, interested, pain, pride, shame, and sympathy would be recognized as still-frame expressions across ten cultures. This is a rigorous test of universality; if one culture fails to recognize an expression at above-chance rates, universality cannot be claimed for that expression. A second hypothesis was that each of these expressions would be selected at higher rates than the most closely matching "basic" emotion investigated in previous studies, as determined by morphological similarity. A third hypothesis was that although these expressions would be recognized at above-chance rates across cultures, there would be differences in recognition rates due to cultural differences. This hypothesis was based on a rich literature of how cultural context, ideal affect, and display rules can significantly influence how a people express emotion (e.g. Barrett, Lindquist, Gentron, 2007; Barrett, Mesquita, & Gentron, 2011; Russell, 1991; Tsai, 2007; Tsai, Louie, Chen, Uchida, 2007).

Methods

Photographs of Facial Displays. We examined the extent to which naïve observers could reliably decode the following facials: amusement, anger, contempt, coyness, desire, disgust, embarrassment, fear, happiness, interest, pain, pride, sadness, shame, surprise, and sympathy. In the accompanying table we provide These photographs were all based on previous experiments that documented specific facial expression behavior associated with the experience of these emotions. The facial expressions of anger, contempt, disgust, fear, happiness, sadness and surprise come from well-studied and established facial displays of these emotions (Darwin, 1872; Ekman, 1992). The photographs of amusement (Keltner 1995), coyness (Reddy 2000), desire (Keltner & Shiota 2003; Gonzaga 2006), embarrassment (Keltner & Buswell 1996; Hejmadi 2000; Keltner & Shiota 2003), interest (Silvia 2008, Reeve 1993), pain (Shiota 2006, Tracy & Robins 2004, Tracy & Matsumoto 2008), pride (Haidt & Keltner 1999; Tracy & Matsumoto 2008), shame (Tracy & Matsumoto 2008), and sympathy (Goetz, Simon-Thomas & Keltner 2010) were based on at least one study that showed behavioral evidence for the facial expression of each emotion. Two researchers certified in the Facial Action Coding System (FACS; Ekman & Friesen, 1978) guided 8 different paid posers in muscle-by-muscle instructions to configure the emotions according to the anatomical movements thought to characterize the prototype of each emotion. The gender and ethnic composition of the posers were: male (1 Asian, 1 African American, 2 European American); female (1 Asian, 1 African American, 2 European American). Table 9 below provides the AUs for each of the emotions of interest, and an example of each photo.

Table 9.
Facial expression examples, FACS action units, and physical descriptions for each expression used in study 2a.

Emotion	Example photo	Action units	Physical description
Amusement		6+7+12+25+26+53	Head back, Duchenne smile, lips separated, jaw dropped

Anger		4+5+17+23+24	Brows furrowed, eyes wide, lips tightened and pressed together
Boredom		43+55	Eyelids drooping, head tilted, (not scorable with FACS: slouched posture, head resting on hand)
Confusion		4+7+56	Brows furrowed, eyelids narrowed, head tilted
Contentment		12+43	Smile, eyelids drooping
Coyness		6+7+12+25+26+52+54+61	Duchenne smile, lips separated, head turned and down, eyes turned opposite to head turn
Desire		19+25+26+43	Tongue show, lips parted, jaw dropped, eyelids drooping
Disgust		7+9+19+25+26	Eyes narrowed, nose wrinkled, lips parted, jaw dropped, tongue show

Embarrassment		7+12+15+52+54+64	Eyelids narrowed, controlled smile, head turned and down, (not scorable with FACS: hand touches face)
Fear		1+2+4+5+7+20+25	Eyebrows raised and pulled together, upper eyelid raised, lower eyelid tense, lips parted and stretched
Happiness		6+7+12+25+26	Duchenne display
Interest		1+2+12	Eyebrows raised, slight smile
Pain		4+6+7+9+17+18+23 +24	Eyes tightly closed, nose wrinkled, brows furrowed, lips tight, pressed together, and slightly puckered
Pride		53+64	Head up, eyes down
Sadness		1+4+6+15+17	Brows knitted, eyes slightly tightened, lip corners depressed, lower lip raised

Shame		54+64	Head down, eyes down
Surprise		1+2+5+25+26	Eyebrows raised, upper eyelid raised, lips parted, jaw dropped
Sympathy		1+17+24+57	Inner eyebrow raised, lower lip raised, lips pressed together, head slightly forward

Emotion Stories. There is a rich controversy surrounding the meaning of recognition data that relies on matching emotion words to faces or voices (Russell, 1994). Cultures vary in whether their languages include words that refer to specific emotions, such as "embarrassment" or "sympathy." Often, a single word in a language will refer to multiple states (Russell, 1991). In light of these variations in the lexical representation of emotion, it is not clear to what extent single emotion words can refer to equivalent meanings across different cultures (Russell, 1991; Izard, 1994). For these reasons, participants in the present investigation matched facial displays to emotion stories. This method was first pioneered by Dashiell (1927), and subsequently used in several investigations (Sauter, Eisner, Ekman, & Scott, 2009; Scott & Sauter, 2006). For the present investigation, for each emotion of interest we created one-sentence stories that focused on a readily understood elicitor or appraisal theme of the emotion as well as the target emotion word. Table 10 presents the stories used for each emotion.

All emotions had one story with the exception of desire, which had two variations for sex and food (e.g., Boucher & Brandt, 1981; Berridge & Winkielman, 2003; Gonzaga et al., 2001). The target stills representing desire were identical in both cases, and the only difference between the desire decoding questions was the story. Our reasoning was to test how the same facial expression would be interpreted for two very different contexts within the same emotion. The stories for the Ekman emotions were taken from a previous cross-cultural study of vocal bursts (Sauter, Eisner, Ekman, & Scott, 2009); the other emotion stories were written using these as models. All stories were restricted to one sentence, and attempted to represent common situations that all people may experience or can easily imagine experiencing from time to time.

Table 10.
Emotion Stories Used in Studies 2a and 2b.

English	**Emotion Story that contains this word**

Amused	**His/her friend just told him a very funny story, and he feels very amused by it.**
Angry	**He/she has been insulted and is very angry about it.**
Awe	**He/she sees the biggest waterfall in the world for the first time, and he is awed by how enormous and powerful it is.**
Bored	**He/she has been waiting for a long time with nothing to do, and he feels very bored.**
Confused	**Something is difficult to understand, and he/she feels very confused about it.**
Contempt	**He/she sees a wealthy person throwing expensive clothing into the garbage, and he feels contempt over such a wasteful act.**
Content	**He/she has been resting comfortably on a peaceful day, and he feels contented.**
Coy	**He/she is flirting shyly with someone across the room, because he is feeling coy.**
Desire	**He/she is hungry and sees some delicious food that he desires.** **He/she sees someone who is very sexually attractive, and he/she feels a strong desire to have sex with them.**
Disgust	**He/she has just eaten some rotten food and feels very disgusted.**
Embarrassed	**He/she had been passionately singing his favorite song until he/she realized his friends were watching, and how he/she feels embarrassed.**
Fear	**He/she is suddenly faced with a dangerous animal and feels very afraid.**
Happiness	**He/she has just met his friend and feels happy that his friend is here.**
Interested	**He/she is learning some useful information which he finds very interesting.**
Pain	**He/she just hit his/her leg on a rock, and it feels painful.**
Pride	**He/she just achieved great honor for himself and his country, and he/she feels a great sense of pride.**
Relief	**He/she has just escaped a dangerous situation and feels very relieved that he was not harmed.**
Sadness	**His/her cousin has just died, and he/she feels very sad.**
Shame	**He/she has been caught doing something that is disgraceful to himself/herself and to his/her family, and he/she feels very ashamed.**
Surprise	**He/she sees a bright light in the middle of the night and is very surprised.**
Sympathy	**He/she sees someone with an injury, and he/she feels sympathy for them.**
Triumph	**He/she has just won a very challenging competition and feels triumphant.**

Translations. A double-back translation method was used for all surveys, emotion words, and emotion stories. Three translators from each culture were chosen if they were fluent in both English and the target language. Translator 1 converted all text from English to the target language. Translators 2 & 3 then took the target language translation and each separately backtranslated the

document to English. The two backtranslated documents were returned to the experimenters, who compared the two backtranslations for consistency and correctness with respect to the original. Any discrepancies were discussed with all three translators, and edits were made accordingly. The translators were also instructed to make the stories sound colloquial, and not like a translation from English.

Participants. College students were notified through email, in person, or through online social networks that an online test was available that would test their understanding of facial emotions. Participants accessed the test at on their home computers through a link from http://ucbpsych.qualtrics.com. In situations where participants did not have a personal computer, one was provided to them at the universities with which we collaborated. We selected for participants who: were between the ages of 18-30 (mean age=24); who had minimal experience living in other cultures (max. 1 month self-reported lifetime travel experience); and who had no prior knowledge of universal expressions, which was ascertained through self-report. Our survey also selected for participants who did not have a significant visual impairment by self-report and by demonstrating their ability to recognize demonstration images before the test began.

Test Procedure. Participants completed the test individually. For each test question, participants were asked to "choose the expression that best fits the story". To guard against inflated recognition rates through forced-choice guessing (e.g., Russell, 1994), participants were also allowed to select "none of the above" for each photograph they judged. While recognition studies using emotion words can use more response options, the length of the stories and the greater demands they place upon memory entails the use of a smaller number of response options when stories are used. Previous experimenters using the story method found that 2 to 4 response options was optimal (Sauter, Eisner, Ekman, Scott, 2009); we chose the upper limit of this range. To avoid any potential gender bias, each emotion story was given twice - one male version, and one female version. To make for a more stringent test, for each target expression we included response alternatives that were of the same valence. Furthermore, one of the alternative choices was an anatomically similar, well-studied emotion (happiness, sadness, surprise, fear, disgust, anger). Table 11 describes the most physiologically similar well-studied emotion for each of our criterion emotions.

Table 11.
Most physiologically similar well-studied emotion for each criterion facial expression in Study 2a.

Study 2a Facial Expression	**Similar Well-studied Expression**
Amused	Happiness
Awe	Surprise
Bored	Sadness
Confused	Anger
Content	Happiness
Coy	Happiness
Desire	Happiness
Embarrassed	Sadness
Interested	Happiness
Pain	Disgust
Pride	Happiness

Shame	Sadness
Sympathy	Sadness

Chance. In each expression-scenario question, the participants were faced with five choices: four expressions and "none of the above". Chance rates are therefore 20% for each emotion.

Analysis. Statistical analysis involved calculating the percent of respondents who chose the target response as well as the percentages of participants who chose the other three alternatives. Nonparametric binomial t-tests were used to determine whether participants chose the target expression at higher rates than chance. Confusion matrices were not produced, since answer choices were randomized from a library of confounds instead of a static list of responses, which is required for confusion matrices.

Results. Tables 12 through 14 show the percent of participants who chose the target expression above and beyond alternatives. Table 12 collapses recognition ratings for each emotion concept across ten cultures with weighted averages. Tables 13 and 14 summarize recognition ratings for each culture by emotion. Values marked as not significant (n.s.) represent images that were not chosen at above-chance rates. Across positive and negative/netural expressions, all of the target photos were recognized in all ten countries except for 1) coyness in Korea, 2) desire (sex) in Japan, 3) interest in Japan/Korea, and 4) sympathy in India.

Comparison vs. Well-studied Emotions. Well-studied emotions include anger, sadness, surprise, fear, disgust, and happiness. In each expression-scenario question, participants were faced with five choices: four expressions and "none of the above". Among the four expressions was the target expression, two randomly chosen within-valence confound expressions, and one well-studied emotion that closely matches the facial morphology of the target emotion (Table 11 above). We wanted to see whether the target emotion was distinctly different from the most closely-matching well-studied emotion. Participants chose the target emotion above the well-studied confound in all cases.

Table 12.

Weighted averages for facial expression recognition ratings across ten cultures. A check under 'Pass' indicates that the stimuli were recognized at above-chance ratings for all cultures.

Concept	Accuracy	Pass
Amusement	81	✓
Anger	84	✓
Boredom	94	✓
Confusion	81	✓
Contentment	66	✓
Coyness	65	X
Desire (food)	68	✓
Desire (sex)	51	X
Disgust	80	✓
Embarrassed	68	✓
Fear	85	✓
Happiness	75	✓

Interest	45	X
Pain	82	✓
Pride	60	✓
Sadness	52	✓
Shame	83	✓
Surprise	77	✓
Sympathy	56	X

Table 13.
Average recognition ratings across ten cultures for positively-valenced facial expressions.

	Amused	Content	Coy	Desire(f)	Desire (s)	Happy	Interest	Pride
China N=52	89	68.5	51	75.5	72	71.5	36	41
Germany N=43	88.5	78	86.5	74.5	53.5	80	61	59.5
India N=45	78	53	52	64	38	56	55	69
Japan N=55	51	60	55.5	63.5	36.5 (n.s)	65	10.5 (n.s.)	39
Korea N=50	55.5	51	33 (n.s)	51	50	70	23 (n.s)	43.5
NZ N=11	94.5	78	94.5	89	67	83.5	50	72.5
Turkey N=46	96	68.5	66.5	66	47	75.5	63	72
Poland N=64	93	67	76.5	63	47	88	42.5	84
Pakistan N=35	92	74.5	65.5	72.5	51.5	79	71	71
USA N=52	86.5	75	87.5	81	63.5	86.5	58.5	62.5

Table 14.
Average recognition ratings across ten cultures for negatively and neutrally-valenced facial expressions.

	Anger	Bored	Confused	Embarrassed	Fear	Pain	Sad	Shame	Surprise	Sympathy
China N=52	91	98	91	73	88	74.5	52.5	89	88	78
Germany N=43	90.5	99	82	80.5	87.5	88	57.5	93.5	73.5	67.5
India N=45	84	84	70	49	86	70	55	88	65	25 (n.s)
Japan N=55	81	93.5	79.5	62	86.5	64.5	38.5	52.5	89	54.5
Korea N=50	79.5	89.5	89.5	47.5	78.5	79	43	76.5	67.5	51
NZ N=11	100	100	89	55.5	89	94.5	67	94.5	89	50
Turkey N=46	52	95.5	80	61	92	86	49.5	85	90.5	64.5

Poland N=64	92	98	58.5	85.5	80	96	52	89.5	65.5	47.5
Pakistan N=35	85.5	93.5	87	82.5	82.5	95.5	53.5	87	72.5	58
USA N=52	92.5	95	95.5	70.5	84	84.5	64.5	89	74.5	62.5

Study 2b: Vocal Expression Decoding in Ten Cultures

Overview

In another ten-culture expression-decoding experiment, we tested participants' abilities to identify nonverbal vocalizations of emotion in a similar manner to Study 2a. The ten participating cultures were China, Germany, India, Japan, Korea, New Zealand, Pakistan, Poland, Turkey, and USA. Participants read simple, one sentence stories written in their native language describing a context in which an emotion is felt, and then chose from a selection of three distinct emotion vocalizations the one that matches the emotion described in the story. If none of the sounds matched the story, the participant could choose the option "none of these". Confounds were again drawn randomly from a bank of nonverbal vocal utterances, and the confounds were always drawn from within the same valence as the target emotion.

We were guided by two central hypotheses. A first was that the emotions amusement, awe, contempt, contentment, desire, disgust, embarrassed, fear, interested, pain, relief, sympathy, surprise, and triumph would be recognized as nonverbal vocal expressions across ten cultures. A second hypothesis was that although these expressions would be recognized at above-chance rates across cultures, there would be differences in recognition rates due to cultural differences.

Vocal Expression Stimuli. The vocal bursts came from previous work on spontaneous emotional expressions. Simon-Thomas, et al. (2009) recruited twenty-six participants to produce a first set of spontaneous vocal bursts, which are non-linguistic sounds with no verbal content, for 15 different emotions. Guided by the results from that study, we used high-definition sound equipment and an anechoic recording environment to record vocal bursts from six different posers, three male and three female. The posers were instructed to produce sounds according to the same emotion prompts from Simon-Thomas et al.'s study. Examples of nonverbal vocal bursts include laughter (amusement), growling (anger), spitting or quick "hm" sound (contempt), retching (disgust), screaming (fear), crying (sadness), etc.

Vocal Decoding Task. We created a multiple-choice emotion test that prompted subjects with a one-sentence story common that contained a target emotion word. The prompt asked them to choose the best emotional sound from the three choices given or "none of the above", if none of the three choices was appropriate. In their cross-cultural study of acoustic bursts, Sauter & Ekman (Sauter, Eisner, Ekman, and Scott, 2009) found that three response options was optimal to avoid unnecessarily low signal ratings due to cognitive overload. We chose the upper limit of this range, to make the task as challenging as possible without introducing cognitive overload. In order to control for gender bias by emotion, each emotion story was given twice - one male version, and one female version.

Emotion Stories. The same stories that were used in Study 2a were also used in Study 2b, with the addition of contempt, relief, and triumph. We did not include vocal bursts for boredom, confused, coy, happiness, pride, and shame, because reliable vocal signals for these emotions have not been documented in previous studies. All stories were again restricted to one sentence, and attempted to represent common situations that all people may experience or can easily imagine experiencing from time to time.

Translations. As in Study 2a, a double-backtranslation method was used for all surveys, emotion words, and emotion stories. Three translators from each culture were chosen if they were colloquially fluent in both English and the target language. Translator 1 converted all text from English to the target language. Translators 2 & 3 then took the target language translation and each separately backtranslated the document to English. The two backtranslated documents were returned to me, after which I compared the two backtranslations for consistency and correctness.

Participants. College-educated participants were notified through email, in person, or through online social networks that an online test was available that would test their understanding of facial emotions. Participants accessed the test at on their home computers. In situations where participants did not have a personal computer, one was provided to them at the universities with which we collaborated. We selected for participants between the ages of 18-30 (average age, 24 years) who had minimal experience living in other cultures (max. 1 month self-reported lifetime travel experience), and who also had no self-reported prior knowledge of universal expressions, basic or otherwise. Our survey also selected for participants who did not have a significant hearing impairment by self-report and by demonstrating their ability to recognize demo sounds before the test began.

Analysis. In each expression-scenario question, the participants were faced with four choices: three expressions and "none of the above". Chance rates are therefore 25% for each emotion. Statistical analysis involved calculating the percent of respondents who chose the target response versus the percent of respondents who chose any of the other confounding choices. Nonparametric binomial t-tests were used to determine whether participants chose the target expression at higher rates than chance.

Results. Tables 15 through 17 show the percent of participants who chose the target expression above and beyond alternatives. Table 15 collapses recognition ratings for each emotion concept across ten cultures with weighted averages. Tables 16 and 17 summarize recognition ratings for each culture by emotion. Values marked as not significant (n.s.) represent nonverbal vocal bursts that were not chosen at above-chance rates. Across positive and negative/netural vocal expressions, all of the target sounds were recognized in all ten countries with the exceptions of sympathy in Korea and surprise in India.

Table 15.

Weighted averages for vocal expression recognition ratings across ten cultures. A check under 'Pass' indicates that the stimuli were recognized at above-chance ratings for all cultures.

Concept	Accuracy	Pass
Amusement	81	✓
Anger	75	✓
Awe	90	✓
Contempt	73	✓
Contentment	78	✓
Desire (food)	74	✓
Desire (sex)	66	✓
Disgust	86	✓
Embarrassed	84	✓
Fear	84	✓
Interest	80	✓

Pain	78	✓
Relief	84	✓
Sadness	90	✓
Surprise	68	X
Sympathy	65	X
Triumph	91	✓

Table 16.

Average recognition ratings across ten cultures for positively-valenced vocal expressions.

	Amused	Awe	Content	Desire(f)	Desire (s)	Interest	Relief	Sympathy	Triumph
China N=52	88	96	76	62.5	60.5	81.5	82	69.5	95
Germany N=43	87	90	82.5	90.5	57.5	88	89.5	69.5	87
India N=45	83	84.9	65.1	64.2	71.7	76.4	77.6	75.5	97.2
Japan N=55	69	89.5	60.5	64	51.5	76	80.5	55.5	88.5
Korea N=50	66	83	65.5	40	48	76.5	79	34 (n.s.)	86.5
NZ N=11	87.5	100	87.5	87.5	87.5	75	75	87.5	100
Turkey N=46	76	92	93	68	77.5	59.5	75.5	75	92.5
Poland N=64	94	96	88	96	87.5	89.5	94	45	94.5
Pakistan N=35	89	84	92	90	56.5	85.5	95	84	88.5
USA N=52	81	86	84.5	84.5	73.5	88	83.5	83	85.5

Table 17.

Average recognition ratings across ten cultures for negatively and neutrally-valenced vocal expressions.

	Anger	Contempt	Disgust	Embarrassment	Fear	Pain	Sadness	Surprise
China N=52	88	93	85.5	87.5	90	89.5	94	58
Germany N=43	77	74.5	80.5	82.5	76.5	76	85	79.5
India N=45	55.7	92.5	67	79.3	70.8	83	90.6	31 (n.s)
Japan N=55	60	75	83.5	80	91	68	93	74
Korea N=50	66.5	75.5	81	85.5	69	64.5	88	63
NZ N=11	100	50	87.5	87.5	87.5	87.5	100	75
Turkey N=46	79	48	91	83	85	79	90.5	59.5
Poland N=64	83	75	100	88	95	83	92.5	94

Pakistan N=35	76	72.5	92	85.5	87	81	87	67.5
USA N=52	81	55.5	88.5	82	87.5	78.5	85	71

Discussion & Conclusion. Of the 30 expressions studied in the face and the voice, 24 were recognized at above-chance rates in ten cultures representing five continents and 453 participants. We summarize these results in Table 18, which suggests which emotions are strong candidates for universal recognition across cultures. The only emotion that did not receive support for universality was sympathy, which was judged at rates no greater than chance in both the facial display and vocalization studies. Entries showing "n/a" were not tested, because at the time of this study, we did not have reliable stimulus examples of these emotions and modalities. The one exception is the emotion contempt, whose facial expression passed two rigorous cross-cultural recognition experiments and was not needed in our study (Ekman, P., 1986, 1988). The vocal expression for contempt, which has not been tested across-cultures, did pass in the vocalization recognition study.

Table 18.
Emotion concepts that passed our universality test for facial or vocal expressions across ten cultures and five continents.

Emotion concept	Facial	Vocal
Amusement	✓	✓
Anger	✓	✓
Awe	n/a	✓
Boredom	✓	n/a
Confusion	✓	n/a
Contempt	n/a	✓
Contentment	✓	✓
Coyness	X	n/a
Desire food	✓	✓
Desire sex	X	✓
Disgust	✓	✓
Embarrassment	✓	✓
Fear	✓	✓
Happiness	✓	n/a
Interest	X	✓
Pain	✓	✓
Pride	✓	n/a
Relief	n/a	✓
Sadness	✓	✓
Shame	✓	n/a
Surprise	✓	X
Sympathy	X	X
Triumph	n/a	✓

Though these data supported our hypotheses, there are important experimental design limitations to consider. These data represent only the beginning of a wide range of possibilities for potential universal expressions across cultures. Though our procedure is strengthened by a methodically conserved, internally valid approach to collecting emotional expression recognition data, it suffers from a lack of external validity. Our facial expressions were represented by static photographs, which are not representative of real emotion displays. Still photographs of emotional expressions lack critical features such as timed vocal bursts, onset, offset, intensity, and nuanced motion of each individual component facial action unit. Though still photographs represent an excellent starting point in determining potential universal candidate, further decoding research using posed dynamic displays is critical to understanding the true nuance of cultural similarities and differences in expression decoding.

Furthermore, our emotion stories by no means illustrate all possible variants of these expressive states, since each story likely represents one of many possible variants of the same expressive theme. Similarly, translations can never be exact and will vary in meaning between cultures. It will be an important validation step for a different research team to go through the same translation process and expression collection in one or more of the same cultures we studied. This will be key to supporting our finding that there are at least 24 universal expressions in the face and the voice. Lastly, further studies should employ the use of naturalistic facial, vocal, and combined facial/vocal displays, since naturalistic displays will include individual differences in expression and are more representative of reality.

The patterns we observed in this study lean neither toward a basic emotion theory approach nor to cultural constructivism approach, but rather to both. This speaks to the literature on what has been called gradients of universality, where emotional expression can be described by both universal patterns and cultural variation (e.g. Haidt, J. & Keltner, D., 1999). We found evidence that although ten cultures could, on average, identify 24 expressions in the face and voice, there were clear differences in recognition rating by culture. We also found evidence that supports the notion that culture and emotion story context are determinants of how expressions are decoded. These findings indicate, perhaps, that there are hybrid theories yet to be explored and studied that go beyond the theory that there are only six universal expressions in the face. Though we do not make any claim to the evolutionary or cultural origin of the archetypal expressions studied here, it is vital for future research to test these hypotheses on people who are culturally isolated. Only then can we begin to theorize about the origin of these expressive patterns, if they are indeed recognized in isolated cultures. One unfortunately unavoidable limitation with this study is that all participants had exposure to globalized media, which is a major confound for this line of experimentation. Most, if not all, of our participants had access to a computer, which caused an inherent selection bias for more educated, higher SES individuals who have direct access to global media. Though we may be trending towards a globally expressive society due to these media, it is important to capture cross-cultural similarities and differences now before our nonverbal recognition patterns become further homogenized. We have merely scratched the surface of our understanding of nonverbal emotional expression, and we look forward to further work that seeks to decode the rich and complex universal, cultural, and individual language of human expression.

XIV. General Discussion and Conclusion

A New Model of Emotion Expression. The current view of the universality hypothesis is that there are only a few facial expressions of emotion that are universally recognized (Ekman,

1972; Ekman & Cordaro, 2011; Izard, 1971, 1994; Matsumoto, Keltner, Shiota, Frank, & O'Sullivan, 2008; Tomkins, 1962, 1963). It is further assumed that "archetypal expressions" of emotion, which are single combinations of facial muscle contractions, are uniformly encoded and decoded across cultures (Izard, 1994). For example, the "archetypal expression" of anger is brows furrowed, upper eyelids raised, lower eyelids tightened, and lips pressed together; surprise includes eyebrows raised, upper eyelids raised, jaw dropped, and lips parted; happiness involves outer and inner eyes contracted, and lip corners raised. There are hundreds of experiments that reference the claim that these archetypal emotions are universally perceived from the face, based on hundreds of studies that performed cross-cultural comparisons (for a review see Elfenbein & Ambady, 2002). Only a few of these studies, however, actually compare Western and non-western raters' accuracy in identifying the same expressions in the face. The strength of a five or ten-culture approach is that recognition differences can be attributed to cultural environment; furthermore, the five or ten-culture approach provides an extremely stringent test of universality. If one culture fails to encode or decode emotion in a similar way to *all* other cultures, then the expression being encoded or decoded is not universal. The strength of a multi-culture approach is that similarities cannot easily be explained by shared practices, environments, traditions, and contact – suggesting that these similarities are due to a psychological universal (Norenzayan & Heine, 2005). These studies provide strong and rigorous evidence that universality of emotional expression exists for a larger set of expressions in the face and the voice than have ever been studied before.

In contrast, the psychological constructionist model assumes that emotion perception is not universal, but instead originates from cultural environment, language, and experiences (Barrett, 2009; Barrett, Lindquist, & Gentron, 2007; Barrett, Mesquita, & Gendron, 2011; Lindquist & Gendron, 2012). Under the social constructionist model, it is extremely unlikely that emotional expressions would be consistently encoded and decoded across cultures, because individual knowledge, concepts, and perceptions of emotions will be entirely different across cultural boundaries. In this view, emotion concepts are grounded entirely on experiential knowledge and cultural obligations about a situated action (Wilson-Mendenhall, Barrett, Simmons, & Barsalou, 2011). This perspective can be refuted by demonstrating that an expression is consistently recognized or used across vastly different cultures. On the other hand, emotional expressions that are not recognized or used in all cultures supports the cultural constructionist model. It is also worth mentioning that a cultural constructionist perspective is not mutually exclusive from a universal one. Variability in perceptions of emotion across and within cultures is to be expected, since the universality hypothesis does *not* claim that all people across the planet will express emotion in exactly the same way every time they feel them; we do not need a hypothesis-driven experiment to see how variable expressions can be from person to person, group to group, culture to culture. The central debate, and also the core topic of this dissertation, regards whether or not *any* similarities exist among the hundreds of thousands of differences. The results of these studies provide strong support for some cultural similarities in how emotion is expressed and recognized, as well as clear support for cultural differences.

As a result of these studies, we propose a new model of universality that incorporates cultural constructivist and basic emotion theory arguments. One central finding in this study is that emotions require stories to be accurately conveyed across cultures. Cultural consistency or universality is particularly evident in experiments that invoke knowledge of an event or action, such as "His friend has told him a funny story, and he is amused," or as Ekman and Friesen 1971 wrote in their seminal work on the universality of disgust "He is looking at something which

smells bad". The universality hypothesis does not assume that language and context are unnecessary to establish cross-cultural emotion perception. On the contrary, story context is critical to accurately translate emotion concepts from one language to another. Furthermore, these studies indicate in their treatment of the emotion concept for "desire" that situation matters to how people decode and encode an expression for desire. The emerging empirical picture, as demonstrated by the studies herein, reflects that 1) there are core patterns in emotion recognition and expression across cultures; 2) these patterns are contingent upon situational contexts or stories; and 3) that there exist clear differences in recognition and expression that can be explained by cultural differences.

Synthesizing Previous Expression Studies. To what extent do humans communicate with a common, nonverbal language of emotional expression? The study of universal emotional expression is central to defining issues in the field of psychology, and more broadly, our understanding of what it means to be human. Studies of emotion signaling are key to investigating how evolution and cultural differences shape the way humans react to fundamental life situations (Ekman & Cordaro, 2011). Findings concerning which emotional states can be signaled in different modalities, such as the face, body and voice, inform classification schemes and taxonomies of emotion (Tracy & Robins, 2004; Ekman, 1992; Keltner & Lerner, 2010). Studies that look at the recognition of emotion across cultures have provided some of the most robust and interpretable evidence concerning the universality and cultural variations in emotion (Matsumoto, et al., 2009; Russell, 1994).

In a first wave of emotion recognition studies, investigators focused on a limited set of emotions. The evidence that anger, disgust, happiness, and sadness have universal facial displays is fairly robust, with some additional evidence for fear and surprise (Elfenbein & Ambady, 2002; Matsumoto, et al., 2008). Recent work in emotion science has expanded upon this list by identifying distinct facial and bodily behaviors for amusement (Keltner & Bonnano, 1997; Shiota, Campos, & Keltner, 2003), awe (Shiota, Keltner, & Mossman, 2007), contentment, embarrassment (Hejmadi, Davidson, & Rozin, 2000), coyness (Reddy, 2000), desire (Gonzaga et al., 2006), interest (Silvia, 2008; Reeve, 1993), pain (Prkachin, 1992; Williams, 2002; Grunau & Craig, 1987; Botvinick, Jha, Bylsma, Fabian, Solomon, & Prkachin, 2005), pride, shame, triumph (Hejmadi, Davidson, & Rozin, 2000; Keltner & Buswell, 1997; Tracy & Robins, 2004; Tracy & Matsumoto, 2008), and sympathy (Keltner & Shiota, 2003). These studies have largely focused on only one or two cultures.

For example, Keltner (1995) coded muscle-by-muscle actions of participants who became embarrassed after making a silly face on camera. Careful frame-by-frame analysis uncovered a fleeting but highly-coordinated 2-3 second display (see also Edelmann & Hampson, 1979; Edelmann & Hampson, 1981), which involved gaze aversion, controlled smiles, and partial face covering with one hand. Other experiments sought to analyze self-conscious displays coincident with gaining or losing status (Tracy & Robins, 2004; Tracy & Matsumoto, 2008; Tracy & Robins, 2007). Tracy and Robins documented expansive postures coincident with the emotion pride, as well as head movements up and back, and expansive arm thrusts upward. Images of these displays were reliably decoded in both industrialized cultures and a remote culture in Burkina Faso (Tracy & Robins, 2008). Tracy and Matsumoto (2008) analyzed the emotional expressions of sighted and blind athletes from 20 different countries at the 2008 Beijing Olympic Judo Games after they had won or lost matches. Sighted and blind winners showed expansive posture, smiles, head up, and arms in the air; sighted and blind losers showed slouched posture, shoulders slumped, and chest caved in.

Beyond the self-conscious emotions, still other studies have documented that experiences of attachment-related, positive emotions are signaled in distinct patterns of behavior. Gonzaga et al. (Gonzaga, Keltner, Londahl, & Smith, 2001; Gonzaga, Turner, Keltner, Campos, & Altemus, 2006) analyzed the nonverbal behaviors that romantic partners displayed as they experienced love and desire while discussing their first date. When the romantic partners felt love, they showed displays of genuine smiling, mutual gaze, affiliative hand gestures, open posture, and leaning forward; when they felt desire they tended to show lip licks, bites, and puckering. In research on responses to suffering, Eisenberg and colleagues (Eisenberg et al., 1989), found that the experience of sympathy is correlated with oblique eyebrows, concerned gaze, and approach behaviors such as forward leans.

There is also a rich literature on the acoustic properties of nonlinguistic emotional sounds, known as vocal bursts (Scherer, 1986; Scherer, 1993; Simon-Thomas, et al., 2007; nelson & Russell, 2011; Banse & Scherer, 1996; Preuschoft & Van Hoff, 1997; Juslin & Laukka, 2003). In Simon-Thomas et al.'s (2009) study, participants' vocal bursts of 13 emotions – anger, disgust, fear, sadness, surprise, embarrassment, amusement, awe, interest, relief, pleasure, enthusiasm, and triumph – were reliably judged as the intended emotion by a second sample of naïve American observers (Simon-thomas, et al., 2009). Sauter, et al. (2010) performed a two-way cross-cultural vocalization experiment with Himba and UK participants, and the spontaneous vocal bursts collected from both cultures were decoded with above-chance accuracy ratings for joy, anger, disgust, fear, sadness, and surprise (Sauter, Eisner, Ekman, & Scott, 2010).

In our first set of analysis, we found consistent, systematic patterns in the facial action behaviors of participants across five different cultures. These data suggest that there may be a set of what might be called "international core sequences" of nonverbal behaviors that covary with the experience of discrete emotions. These sequences, or subsets of actions, may be particularly effective in communicating emotion across cultures and despite linguistic boundaries. This diverges significantly from previous theories on emotional expression across cultures ranging from the rigid archetypes of basic emotion theory to the fluid, random expressions in cultural constructionism. These data imply that universal expressions are neither perfectly uniform, nor are they completely based on chance. The behavioral patterns observed in Study 1 provide a foundational argument against the notion of concrete, archetypal displays. Rather, universal nonverbal expressions are likely to vary widely across cultures, as well as systematic individual differences. After carefully analyzing these patterns of variability across five different cultures, we also observed statistically-grounded display patterns of action units. Each emotion story prompt resulted in participants activating, on average, specific subsets of facial action units more than others. This indicated that nonverbal facial expression is likely not limited to specific "archetypal" displays, but is rather more variable and fluid across subsets of behaviors. For example, participants hearing the disgust story were far more likely to activate AU 9 (nose wrinkler) than AU 12 (lip corners raised). This does not mean, however, that participants always activated AU 9 and never activated AU 12 – on the contrary, probability dictated that more participants would activate AU 9, but did not restrict them from activating AU 12 sometimes. Our data simply indicated the relative probabilities of behaviors across a large sample of action units, emotions, cultures, and expressions. Some subsets of facial and bodily behaviors turned out to be far more statistically probable than others, and the subsets that were probable by emotion for all cultures were said to be "international core sequences". Subsets that were probable by emotion for only some cultures were said to be "cultural variants".

In our second set of analyses, out of 30 new expressions studied in the face and the voice, 24 were recognized at above-chance rates in ten cultures representing four continents. Our findings suggest that the following emotional expressions are reliably communicated with facial/bodily display across the ten cultures: amusement, anger, boredom, confusion, contentment, desire (food), disgust, embarrassment, fear, happiness, pain, pride, sadness, shame, and surprise. The following expressions can be communicated with vocalization: amusement, anger, awe, contempt, contentment, desire (food), desire (sex), disgust, embarrassment, fear, interest, pain, relief, sadness, and triumph. We found evidence for nine new, potentially universal facial/body expressions above and beyond what have been called the "basic" emotions: anger, disgust, happiness, fear, sadness. We also found evidence for significant cultural variations in the accuracy with which these static photographs were judged. Using data from the World Values Survey, we found that cultural value systems involving independence and short-term orientation positively correlated with the ability to decode positive facial affect. Our second set of analyses found evidence for an additional 15 potential universal candidates from ratings of nonverbal acoustic vocal bursts. In support of our cultural findings in Study 1a, we also found that short-term orientation was positively correlated to raters' accuracy in identifying positively-valenced vocal expressions.

The only expression that did not receive some support for universality was sympathy, which was judged at rates no greater than chance in both the facial display and vocalization studies. It is interesting to note that sympathy is quite reliably conveyed through tactile contact (Hertenstein et al., 2008), suggesting that this emotion may be conveyed universally by only one modality. We did not study the facial expression of contempt, a focus in two rigorous cross-cultural recognition experiments and was not needed as a comparison in our study (Ekman & Friesen, 1986; Ekman & Heider, 1988). The vocal expression for contempt, which has not been previously tested across-cultures, was recognized in the 10 cultures in this study.

Gradients of Universality. In an earlier study of facial expression recognition, Haidt and Keltner proposed a gradient of universality – that in specific modalities of expression, some emotions are more readily recognized than others (Haidt & Keltner, 1999). With 10 cultures providing data, we were in a strong position to look at this concept both for the face (Fig. XX) and the voice (Fig. XX). We cannot make uniform comparisons across modalities, for we studied slightly different emotional expressions in the face and voice, but informal analysis of these figures is instructive. Some expressions seem more universal across the two modalities (e.g., fear, disgust, amusement) than others (desire, sympathy). Other expressions demonstrate strong universality in one modality but not another: for example, anger fares well in the face, but less so in the voice. Claims about the universality of an emotion, and the extent to which it varies across cultures, depend on the modality of expression.

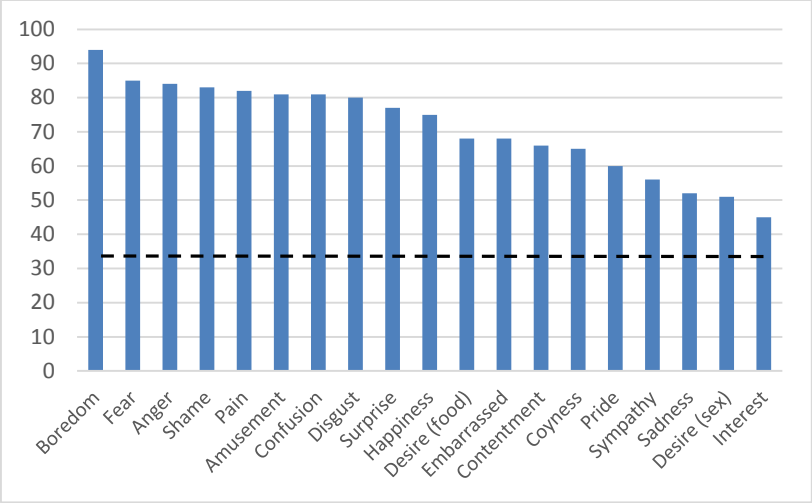


Fig 3. Recognition rates in identifying 19 emotional expressions in the face/body across ten cultures. Dashed lines indicate chance levels (25%).

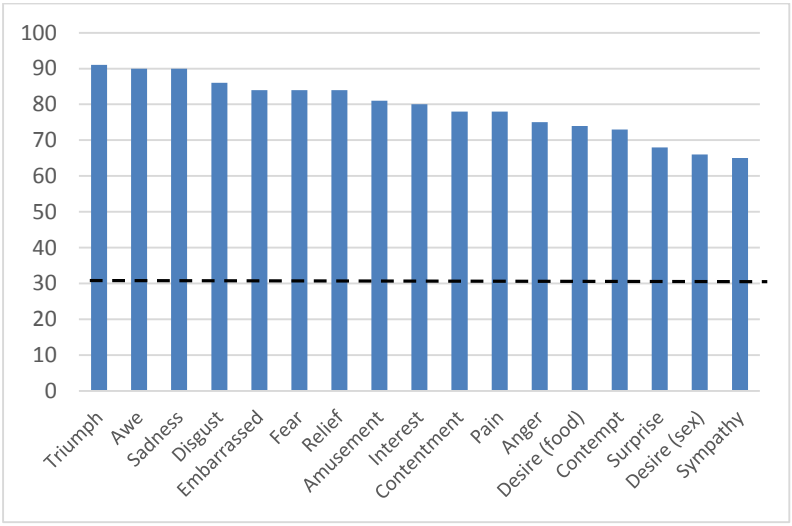


Fig 4. Recognition rates in identifying 17 emotional expressions in the voice across ten cultures. Dashed lines indicate chance levels (20%).

Strengths. Study 1 shows for the first time that there are what might be called "international core sequences" of emotional expression, which are subsets of behaviors that tend to covary with participants' experience with discrete emotion stories. One of the major strengths of Study 1 is that it extends far beyond one and two-culture experiments, and it employs data from three cultures that are rarely included in expression research: India, Korea, and Japan. This allows us to make a stronger case for the existence of cross cultural similarities in expression, since behavioral patterns are less likely to be due to cultural overlap when more cultures are tested. These data revealed behavioral actions in the face and body that participants' found useful in conveying 22 different emotional events. The breadth of the emotion concepts we tested extends beyond the well-studied six emotions happy, sad, anger, surprise, fear, and disgust. Studying 22 states allowed us, for the first time, to make a comparison as to how "universal" or "culturally variable" each expression was by comparing the frequency with which participants used subsets

of facial and bodily behaviors. Our procedure was novel, allowing participants to freely respond using their face, body, and voice to emotion prompts without cultural or demographic primers. Our analysis method was also novel, because we calculated the individual frequencies of all possible action unit and bodily behaviors. This allowed us to observe patterns both within and between cultures, and make predictions about which subsets of behaviors were more likely to occur for each emotion concept. The procedure is strengthened by a methodologically conserved, internally valid approach to collecting emotional expressions across cultures. We collected true-to-life expressions by presenting participants with minimal instructions, allowing them to freely respond using whichever expressive modalities they liked. This enabled us to study a wide breadth of emotional states, rather than conducing a highly-focused study on a single emotion. This method helped us avoid the incredibly challenging task of finding universal elicitors of emotion, with the aim of studying "real, spontaneous" reactions to 22 different emotional events. It would perhaps be impossible, or at least unethical, to elicit pain, sadness, shame, fear, anger, disgust, and embarrassment all within the same experiment. These methods allowed us to survey such a wide breadth of emotions without psychologically draining or perhaps harming our participants.

Study 2 shows for the first time that there are cross-cultural generalizations in emotional expression as well as cross-cultural variability. One of the key contributions to this study is that it clarifies, in part, the ways in which emotion recognition is shaped by culture by offering a first look at gradients of universality. This approach attempts to rectify nearly 100 years of debate about whether expressions of emotion are universal or shaped by culture. Our data clearly indicate that both models provide accurate, though partial, representation of how environment shapes expressions that seem to be universally recognized. The inclusion of nonverbal vocal bursts in a universal expression study of 22 emotional states is particularly noteworthy, as the cross-cultural evidence on this modality is far more limited. Also, though the face and voice cannot be directly compared since they are different modalities, this study provides a first comparison of how, overall, modality affected the degree of cross-cultural consensus. These findings indicate that the voice modality produced the most agreement, though this conclusion is made with caution since a direct comparison cannot truly be made between expressive modalities.

Another methodological strength in study 2 is its cross-cultural sampling, since it goes above and beyond expression studies limited to single-culture and two-culture datasets. This method allowed us to contribute to the literature on emotion recognition by suggesting that there may be many more emotional experiences that can be interpreted across-cultures. Our methods, for the first time, compared new within-valence emotion expressions to similar expressions drawn from the "six basic emotions". The results indicated that these additional expressions were not only recognized across ten cultures, but were also chosen above and beyond the six basic emotions. Finally, this study is the first to test the cross-cultural recognition of sixteen new emotion states, whose recognition rates have never been compared across more than one or two cultures.

Limitations. The evidence from this research points to several emotions that can be reliably signaled in the face, body, and voice that have not been studied across such a wide range of cultures. Alongside the promise of these findings, several limitations of the present research must be borne in mind. Our facial expressions were represented by static photographs, which are not representative of real emotion displays (Russell, 1994). Still photographs of emotional expressions lack critical features such as timed vocal bursts, onset, offset, intensity, and nuanced motion of each individual component facial action unit. Though still photographs represent an excellent starting point in determining expressions that may be universal, further decoding research

using posed dynamic displays is critical to understanding the extent to which emotion is recognized in different cultures.

Our emotion stories were highly scripted, and by no means illustrate all possible variants of these emotions, nor the cultural variations in the situations that produce emotion (Markus & Kitayama, 1991). Our data for desire clearly illustrate the importance of context, because for this state we tested two story variants for the same expression: desire (food) and desire (sex). Even though the exact same stimuli and emotion word "desire" were used, the desire (food) item passed all ten cultures, where the desire (sex) item did not. Similarly, translations can never be exact and will vary in meaning between cultures. It will be important for future work to capture interpretations of the facial expressions and vocal bursts studied in the current investigation with different methods, most notably free response interpretations of the expressions.

As has often been noted, it will be important for future research to use spontaneous displays of emotion, as well as displays that involve the face, body, and the voice. Spontaneous displays are more likely to involve individual difference nuances, as well as cultural variations, that might make for greater difficulty in interpreting emotion from the face and body.

We also note that our participants made judgments of facial expressions before making judgments on the voices, which was a part of a comprehensive test of emotion recognition. It is possible, and even likely, that completing the facial recognition task influenced participants' ability to judge the vocal bursts. In light of this concern, we gathered data on the faces and vocal bursts separately in the US, and found similar levels of accuracy in judging the facial expressions (69.8% recognition) and vocal bursts (78.6% recognition) as the overall levels of accuracy observed in this investigation. We also note that the levels of accuracy observed in our vocal burst study were comparable to those observed in similar studies, such as that of Simon-Thomas and colleagues (Simon-Thomas, et al., 2009).

Finally, it will be important to document how members of isolated cultures interpret the facial and vocal displays studied here. The participants in our 10 cultures, although living in societies that differ dramatically in terms of political structure, economic development and equality, self-construal, and religion, were all university students, and no doubt had extensive access to the western media and the Internet. Stronger confidence in the universality of the emotional expressions studied in the present investigation would be justified by data from remote cultures.

Conclusion Summary. The present investigations suggests that 24 emotional expressions are potential candidates for universality, and that universal expressivity is not limited to just facial expression. These data support theories proposing that there may be a nonverbal human language that transcends culture, linguistics, and environment. These results point to several promising lines of inquiry, notwithstanding the limitations discussed herein. What is the developmental unfolding of the recognition of this more diverse array of emotions (Russell, 1994)? What precursors to this broader array of expressions can be found in other primates? Why is it that some emotions are more readily signaled in the face, and some in the voice? Answers to these questions await a next wave of emotion expression research; we hope to be enabled by the findings of the present investigation.

As a result of these studies, we propose a new model of universality that provides an explanation for cultural variation as well as universal patterns. The central finding in these studies is that the nonverbal language of human emotional expression is neither totally random nor completely predictable. The universality hypothesis states that discrete emotional expressions will be recognized at above-chance rates across cultures. We propose a new, updated definition of what

it means to be a universal expression based on these findings. A new universality hypothesis that more readily incorporates the vast body of research on nonverbal displays might be: "Subsets of behaviors that tend to covary with fundamental life experiences are universal." In this model, story context is critical to accurately translate emotion concepts from one language to another. Furthermore, these studies indicate in their treatment of vocal bursts that there may be entire modalities of communication that have yet to be studied for universal patterns, such as touch.

The emerging empirical picture, as demonstrated by the studies herein, reflects that although there are clear and systematic differences in the recognition and display of emotional expressions across cultures, there also exist core patterns in these behaviors that transcend cultural and linguistic boundaries. We leave it to future research to usher in the next era of universal emotion theory and its implications and application to the world.

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Appendix A

Appendix Table A.1.

Appendix Table A.1
Sequence overlap scores for Chinese facial expressions in Study 1.

Emotion concept	Core sequence	Cultural variation	Combined
Amusement	.84	.13	.85
Anger	.27	.31	.46
Awe	.54	N/A	.54
Bored	.22	.40	.51
Confused	.41	.25	.52
Contempt	.30	.19	.43
Content	.37	.43	.57
Coy	.59	.13	.62
Desire food	.54	.26	.62
Desire sex	.42	.39	.53
Disgust	.53	.11	.56
Embarrassed	.49	.28	.55
Fear	.51	.40	.61
Happiness	.68	N/A	.68
Interested	.16	.50	.53
Pain	.61	.31	.69
Pride	.49	.30	.58
Relief	.58	.13	.62
Sadness	.39	.36	.54
Shame	.43	.36	.56
Surprise	.75	.12	.76
Sympathy	.26	.33	.43
Triumph	.75	.22	.76

Appendix Table A.2

Sequence overlap scores for Indian facial expressions in Study 1.

Emotion concept	Core sequence	Cultural variation	Combined
Amusement	.73	N/A	.73
Anger	.16	.32	.44
Awe	.64	.19	.74
Bored	.33	.32	.44
Confused	.27	.35	.45
Contempt	.25	.42	.49
Content	.51	.10	.52
Coy	.66	.31	.66
Desire food	.47	.25	.51
Desire sex	.36	.20	.44
Disgust	.44	.33	.52
Embarrassed	.60	.30	.70
Fear	.59	.15	.60
Happiness	.71	N/A	.71
Interested	.11	.34	.38
Pain	.66	.30	.72
Pride	.40	.35	.50
Relief	.54	.28	.58
Sadness	.41	.34	.55
Shame	.35	.44	.57
Surprise	.63	.32	.70
Sympathy	.29	.19	.38
Triumph	.71	.20	.71

Appendix Table A.3

Sequence overlap scores for Japanese facial expressions in Study 1.

Emotion concept	Core sequence	Cultural variation	Combined
Amusement	.71	.13	.74
Anger	.18	.35	.44
Awe	.63	N/A	.63
Bored	.28	.35	.46
Confused	.40	.38	.54
Contempt	.31	.30	.42
Content	.37	.32	.50
Coy	.65	.28	.67
Desire food	.47	.24	.54
Desire sex	.41	.45	.61
Disgust	.54	.26	.59
Embarrassed	.60	.19	.62
Fear	.48	.34	.58
Happiness	.71	N/A	.71
Interested	.31	.48	.62
Pain	.75	.20	.78
Pride	.47	.36	.60
Relief	.60	.34	.67
Sadness	.46	.36	.58
Shame	.37	.38	.52
Surprise	.71	.20	.74
Sympathy	.31	.42	.53
Triumph	.62	.12	.64

Appendix Table A.4

Sequence overlap scores for Korean facial expressions in Study 1.

Emotion concept	Core sequence	Cultural variation	Combined
Amusement	.76	N/A	.76
Anger	.23	.25	.49
Awe	.68	.10	.68
Bored	.30	.40	.50
Confused	.35	.42	.56
Contempt	.33	.26	.44
Content	.46	.21	.51
Coy	.56	.22	.58
Desire food	.56	.15	.58
Desire sex	.48	.27	.57
Disgust	.52	.27	.59
Embarrassed	.69	.15	.72
Fear	.52	.24	.57
Happiness	.74	N/A	.74
Interested	.22	.52	.58
Pain	.70	.29	.77
Pride	.45	.40	.61
Relief	.64	.23	.70
Sadness	.32	.47	.58
Shame	.32	.34	.49
Surprise	.68	.10	.68
Sympathy	.27	.38	.47
Triumph	.73	N/A	.73

Appendix Table A.5

Sequence overlap scores for American facial expressions in Study 1.

Emotion concept	Core sequence	Cultural variation	Combined
Amusement	.75	N/A	.75
Anger	.31	.29	.46
Awe	.67	N/A	.67
Bored	.25	.43	.48
Confused	.50	.27	.57
Contempt	.32	.37	.50
Content	.56	.16	.57
Coy	.48	.42	.63
Desire food	.36	.30	.49
Desire sex	.42	.25	.50
Disgust	.64	.08	.64
Embarrassed	.53	.15	.54
Fear	.63	.34	.69
Happiness	.77	.11	.77
Interested	.29	.49	.59
Pain	.67	.42	.78
Pride	.52	.23	.57
Relief	.61	.13	.65
Sadness	.39	.41	.59
Shame	.43	.34	.58
Surprise	.69	.10	.69
Sympathy	.29	.46	.56
Triumph	.63	.17	.68