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Emotions Emerge from More Basic Psychological Ingredients: A Modern Psychological Constructionist Model

Kristen A. Lindquist
Department of Psychology, University of North Carolina at Chapel Hill, USA

Abstract

Over a century ago, William James outlined the first psychological constructionist model of emotion, arguing that emotions are phenomena constructed of more basic psychological parts. In this article, I outline a modern psychological constructionist model of emotion. I first explore the history of psychological construction to demonstrate that psychological constructionist models have historically emerged in an attempt to explain variability in emotion that cannot be accounted for by other approaches. I next discuss the modern psychological constructionist model of emotion that I take in my own research, outlining its hypotheses, existing empirical support, and areas of future research. I conclude by arguing that psychological constructionist models can help scientists better understand the human mind.

Keywords
emotion, psychological construction

Over a century ago, William James (1884) asked "What is an emotion?," and researchers have been debating the answer ever since (see Gendron & Barrett, 2009). Perhaps the most common answer to this question—written in the pages of textbooks, referenced in the courtroom, or examined on therapists' couches—is that emotions are mental states given by the structure of the nervous system, which result in consistent and specific patterns of physiology, facial muscle movements, feelings, and behavior. This is often called the "basic emotion view" on the premise that English emotion categories such as "anger," "disgust," "fear," "sadness," "happiness," etcetera, are psychologically and biologically basic (i.e., fundamental) states. In philosophical terms, these criteria translate into the idea that emotions are *natural kinds*: categories that exist in nature with firm boundaries that can be identified independently of human perception.

Although a natural kinds model of emotion is consistent with commonsense, one of the first psychologists to broach the topic of emotions took an altogether different tack. James (1884, 1890) argued that emotions are complex perceptions that are created in the mind of a perceiver when people make meaning of basic visceral feelings (e.g., a change in heart rate) in a given context (e.g., encountering a bear). James' argument that emotions are composites of more basic psychological parts formed the first psychological constructionist models of emotion.[1] Psychological constructionism has remained an important theoretical thread in the psychological literature to this day (Gendron & Barrett, 2009).

Psychological constructionist approaches are united in the hypothesis that emotions are mental events that are constructed of more basic psychological processes. Rather than treating variability in emotional responding as measurement error, constructionist models assume that emotions are events that are created in the mind of a perceiver to fit a certain situation. I begin this article by reviewing the history of psychological constructionism in the emotion literature, pointing out that psychological constructionism has existed as a viable framework for understanding the nature of emotion for over a hundred years and that a natural kinds approach to emotion has been questioned for nearly as long. I next describe how my own modern psychological constructionist approach fits in this historical context, and outline the hypotheses and existing support that I have acquired for the approach thus far. Finally, I point to the important next steps required to validate and expand on a psychological constructionist approach, and discuss why

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Corresponding author: Kristen Lindquist, Department of Psychology, University of North Carolina, 321 Davie Hall, Campus Box #3270, Chapel Hill, NC 27599, USA.
Email: kristen.lindquist@unc.edu

psychological constructionism is a useful framework for understanding the human mind in general.

Psychological Constructionism Past to Present: A Model for Explaining Variability in Emotion

As indicated by this special section, the field of psychology is currently experiencing a surge in psychological constructionist models of emotion (also see Barrett, 2006b; Clore & Ortony, 2013; Cunningham, Dunfield, & Stillman, 2013; Cunningham & Kirkland, 2012; Lindquist & Barrett, 2012; Lindquist & Gendron, 2013; Roy, Shohamy, & Wager, 2012; Russell, 2003; Wilson-Mendenhall, Barrett, Simmons, & Barsalou, 2011). This surge is attributable to two sources. First, the body of evidence amassed over the last century has led researchers to conclude that emotions are not natural kinds. Recent reviews demonstrate that emotions such as "anger," "disgust," "fear," etcetera, are not associated with consistent and specific peripheral physiological responses (Barrett, 2006a; Cacioppo, Berntson, Larsen, Poehlmann, & Ito, 2000; Mauss & Robinson, 2009), facial muscle movements (Barrett, 2006a; Russell, Bachorowski, & Fernández-Dols, 2003), vocal patterns (Barrett, 2006a; Russell et al., 2003), or behaviors (Baumeister, 2012). Second, several decades of neuroscience research have amplified doubt that emotions are natural kinds. Emotions do not correspond consistently and specifically to anatomically given neural circuits (Barrett, Lindquist, Bliss-Moreau et al., 2007; LeDoux, 2012a, 2012b; Touroutoglou, Lindquist, Hollenbeck, Dickerson, & Barrett, 2013) or functional brain activity (Lindquist, Wager, Kober, Bliss-Moreau, & Barrett, 2012). These data simultaneously point to the involvement of other psychological processes (e.g., memory/semantic knowledge; Kober et al., 2008; Lindquist, Wager, Kober et al., 2012) in emotions that cannot be accounted for by natural kinds approaches. Together, the data suggest that it is time for psychology to adopt a new explanatory framework for the mental states that people call "emotions."

Psychological Constructionism as a Reaction to Natural Kinds Approaches in the 19th Century

The recent rise of psychological constructionism seems unprecedented, unless you take a careful look at the history of the emotion literature. Psychological constructionist models often emerged throughout history to explain validation failures of natural kinds models of emotion. Indeed, James' own psychological constructionist model was crafted in contrast to Darwin's writings on emotion (1872/1965). Darwin argued that certain mammalian behaviors reflect inherited mental states that he named with English emotion categories.[2] In reaction, James (1890) argued that "the trouble with emotions in psychology is that they are regarded too much as absolutely individual things. But if we regard them as products of more general causes . . . then the mere distinguishing and cataloguing becomes of subsidiary importance" (James, 1890, p. 449). To James' mind there are as many varieties of emotions as shapes of rocks on a New England farm (with the implication that detailing the varieties of either was equally trivial). James' contemporary, Wilhem Wundt (Wundt, 1897/1998), argued that emotions are not modular packages, but mental "compounds" comprised of more basic psychological elements. Foreshadowing the constructionists to follow, Wundt hypothesized two basic elements of the mind: simple feelings (possessing hedonic tone and activation) and a form of interpretation he called "ideation." Unfortunately, James and Wundt possessed a limited methodological toolbox (introspection only got them so far in hypothesis testing) and psychological constructionist ideas soon lost influence.

The early 20th century was marked by the emergence of several natural kinds approaches, which argued that emotions derive from specific neural structures (Cannon, 1921) and produce specific and consistent outcomes (e.g., facial and physiological responses, Allport, 1924; Cannon, 1921; overt behaviors, Watson, 1919). These approaches incorporated Darwin's ideas about evolution and hypothesized, for instance, that certain facial behaviors were specifically associated with certain emotion categories because they served an adaptive function (Allport, 1924). In response, the next wave of psychological constructionism (Duffy, 1934, 1941; Dunlap, 1932; Harlow & Stagner, 1932; Hunt, 1941) pointed out that emotions were highly variable events and lacked sufficient facial, physiological, or behavioral regularity to give evidence of natural kinds categories such as anger, disgust, fear, etcetera (Duffy, 1934, 1941; Dunlap, 1932; Hunt, 1941). To account for such variability in emotion responding, early constructionists instead concluded that emotions are states tailor-made to a given context, which emerge when more elemental processes such as basic hedonic feelings (Harlow & Stagner, 1932) or feelings of arousal (Duffy, 1941, 1957) are made meaningful using cognitive interpretation (Duffy, 1941, 1957; Dunlap, 1932; Harlow & Stagner, 1932).

Following a brief wave of behaviorism (during which emotion was mostly out of vogue as a scientific topic), history repeated itself again, and a new crop of natural kinds and psychological constructionist views on emotion emerged. The natural kinds models again argued that emotions emerged from dedicated mechanisms in the nervous system (e.g., "facial affect programs"; Tomkins, 1962) and had consistent and specific facial, physiological, experiential, and behavioral concomitants (Ekman, 1972; Izard, 1971; Tomkins, 1962). Contemporary psychological constructionist models argued that emotions were underlain by basic affective dimensions and that the situation determined how affective feelings were experienced as instances of different emotions (Mandler, 1975; Schachter & Singer, 1962). Although this period witnessed the first empirical evidence for a psychological constructionist view (Schachter & Singer, 1962), the natural kinds approach overwhelmingly held sway for the next 40 years or so, with researchers continuing the search for the peripheral physiological (e.g., Ekman, Levenson, & Friesen, 1983), facial (e.g., Ekman, Frank, & Ancoli, 1980; Matsumoto, 1990), vocal (e.g., Scherer, Banse, Wallbott, &

Goldbeck, 1991), and then neural (e.g., Sprengelmeyer et al., 1996) basis of natural kinds of emotion. As in the beginning half of the century, other researchers critically questioned whether the data were sufficient to validate natural kinds models of emotion (Fernández-Dols, Sánchez, Carrera, & Ruiz-Belda, 1997; Ortony & Turner, 1990; Russell, 1980, 1983, 1994, 1995; Turner & Ortony, 1992), but the approach remained strong even in the face of conflicting evidence.

Natural Kinds, Appraisal Models, and Psychological Constructionism: Competing Views in the Late 20th Century

The sustained success of the natural kinds approach during the latter half of the 20th century can be attributed in part to the (re)emergence of causal appraisal approaches during that time.[3] Although the first causal appraisal model of emotion emerged early in the history of psychology (Irons, 1894), and again in the mid-20th century (Arnold, 1960), causal appraisal approaches really began to exert an influence after the cognitive revolution of the 1970s (for a discussion, see Gendron & Barrett, 2009). According to causal appraisal approaches, a cognitive appraisal (Arnold, 1960; Irons, 1894; Lazarus & Folkman, 1984), or a suite of appraisals (Roseman, 1984, 1991; Scherer, 1984; Smith & Ellsworth, 1985) makes meaning of the stimulus situation, which in turn triggers the emotion. As per basic emotion approaches, many early causal appraisal approaches assumed that the resulting emotion triggers a set of consistent and specific physiological changes, facial muscle movements, behavior, feelings, and so on (e.g., when a person appraises that a dark alley is uncertain, unpleasant, and that she lacks control of the situation, she might experience fear which in turn generates an increased heart rate, sweating, widened eyes, and the tendency to run away; for a discussion on causal appraisal models, see Gross & Barrett, 2011). This hypothesis amounts to the idea that emotions are natural kinds by virtue of homology: all instances of the same category (e.g., anger) emerge from the same causal mechanism (a specific appraisal[s]). By hypothesizing that the appraisal is an intervening mechanism between the stimulus and emotion, causal appraisal models made it easier to accommodate evidence of variability in physiological, facial, and behavioral patterns into the natural kinds framework: such variability could occur because different people appraise the same stimulus in a different way, and thus experience different emotions (Roseman, 2011).[4] The historical effect was to shift the empirical emphasis away from observing within-emotion category similarity in objective measurements (of physiology, facial muscle movements, vocal acoustics, behavior), and towards observing the cognitive dimensions that characterized emotions in self-report (e.g., Roseman, 1991; Smith & Ellsworth, 1985).

At first blush, causal appraisal models appear similar to psychological constructionist approaches, especially since both can accommodate greater variability in emotional responding than basic emotion approaches. Both causal appraisal and psychological constructionist approaches also hypothesize a role for "interpretation" in emotion, leading to the false perception of similarity. Yet causal appraisal approaches differ from psychological constructionist approaches in two important ways. First, causal appraisal approaches view appraisals as a specific mechanism that is itself distinct from the emotion (for a review of causal appraisal models, see Ellsworth & Scherer, 2003; see Figure 1). To the contrary, psychological constructionist approaches assume that the interpretive component is constitutive of the emotion—just as specific values of hue, brightness, and saturation are constitutive of perceiving colors such as "cardinal red" versus "claret" versus "poppy." Second, causal appraisal models assume that emotions include distinct steps: appraisals evaluate the stimulus situation (see Ellsworth & Scherer, 2003), which then causes the emotion, which causes associated bodily changes. To the contrary, psychological constructionist approaches hypothesize that an interpretive process makes meaning of on-going bodily changes in light of

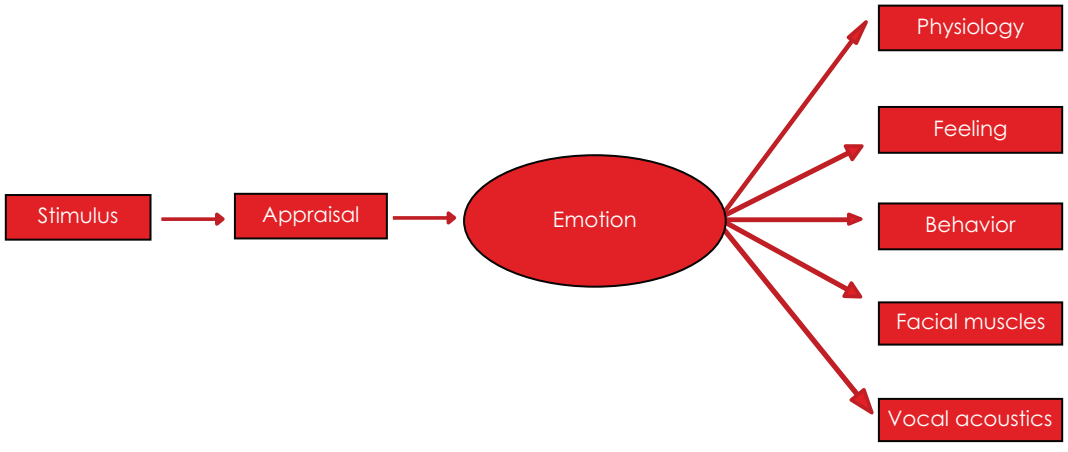

Figure 1. Causal appraisal models hypothesize that the cognitive appraisal (or a suite of appraisals) of the stimulus situation triggers a discrete emotion. In this regard, they are similar to basic emotion approaches, and are natural kinds approaches by nature of the fact that they hypothesize that all emotions of the same category (e.g., anger) have shared homology.

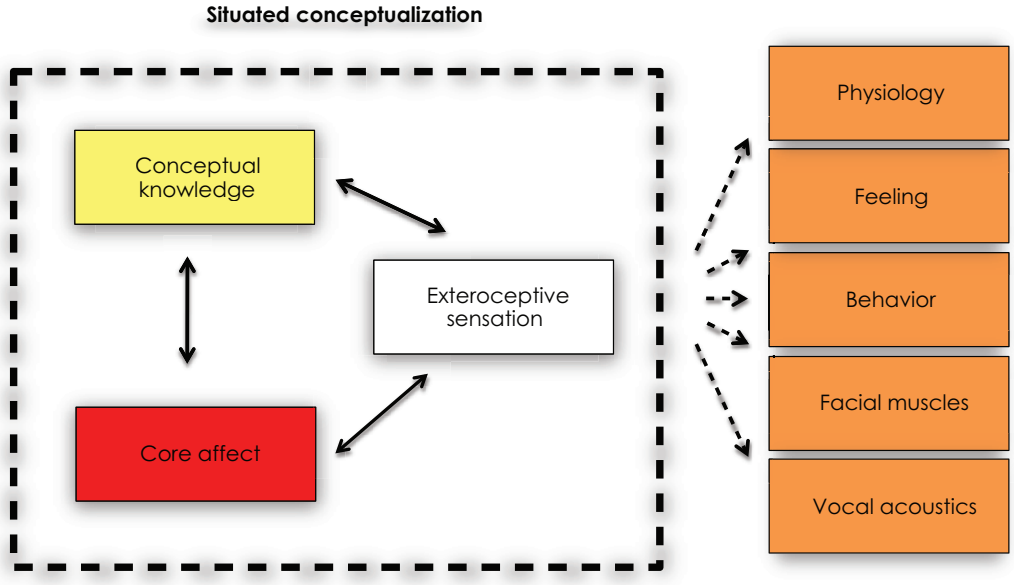

Figure 2. Psychological constructionist approaches hypothesize that core affective changes (caused in part by interactions with the stimulus situation) are made meaningful using representations of prior experiences that are tied to the context.

information about the stimulus situation (see Figure 2). Neither bodily changes nor interpretation are thought to "turn on" in a given context, but instead are ever-present processes that are continually interacting with one another in a conscious brain.

Further blurring the line between appraisal and psychological constructionist approaches, recent "constitutive appraisal" approaches have moved away from making strong causal hypotheses about the role of appraisals in emotion (e.g., Clore & Ortony, 2000, 2008; Moors, 2013; Scherer, 2009a, 2009b). Like causal appraisal approaches (and unlike psychological constructionism), constitutive appraisal models (Moors, 2013; Scherer, 2009a, 2009b) still assume that emotion categories refer to distinct states with specific functional importance. Yet unlike causal appraisal approaches (and like psychological constructionism), constitutive appraisal approaches (e.g., Clore & Ortony, 2000, 2008; Scherer, 2009a, 2009b) highlight the "informational" (Moors, 2013) content of appraisals rather than viewing them as mechanisms of the emotion, per se. Some constitutive appraisal models (e.g., Clore & Ortony, 2000, 2008) are thus quite similar to psychological constructionist approaches (e.g., Kirkland & Cunningham, 2012; Lindquist & Barrett, 2008a) because they view appraisals as descriptions of what it is like to experience an emotion (for discussions, see Gross & Barrett, 2011; Lindquist, Wager, Bliss-Moreau, Kober, & Barrett, 2012).[5] For constitutive appraisal and psychological constructionist approaches to remain theoretically distinct, researchers taking a constitutive appraisal approach thus need to be clear about what the extra level of psychological description (i.e., the appraisals) contributes to an understanding of emotion above and beyond the domain-general conceptual knowledge hypothesized by constructionist accounts. If appraisals are merely conceptual content (i.e., what it is like to experience an emotion), then it is more parsimonious to hypothesize a domain-general conceptual process that is a basic ingredient of the mind and contributes to all varieties of mental states (as in Lindquist & Barrett, 2012).

The New Wave of Psychological Constructionism

Regardless of the precise form they take, it is clear that researchers at the beginning of the 20th century are making fewer (or less stringent) natural kinds claims about emotion. Over a century of data now suggests that emotions are far too variable to exist as entities triggered by specific cognitive or neural mechanisms and measurable as discrete packages of bodily, facial, and behavioral outputs; this has spawned a number of new psychological constructionist accounts on emotion. Although it would appear that history is repeating itself, the new wave of psychological constructionism is unique for several reasons. First, new constructionist approaches draw heavily on neuroscientific findings for hypothesis generation and testing (Barrett, Lindquist, Bliss-Moreau et al., 2007; Barrett, Mesquita, Ochsner, & Gross, 2007; Cunningham & Kirkland, 2012; Lindquist & Barrett, 2012; Lindquist, Wager, Kober et al., 2012; Oosterwijk et al., 2012; Roy et al., 2012; Wilson-Mendenhall et al., 2011). Second, for the first time,[6] psychological constructionist approaches are moving beyond merely disconfirming natural kinds models, and are successfully conducting empirical validations of constructionist hypotheses (Gendron, Lindquist, Barsalou, & Barrett, 2012; Kirkland & Cunningham, 2012; Lindquist & Barrett, 2008a; Lindquist, Barrett, Bliss-Moreau, & Russell, 2006; Oosterwijk et al., 2012; Russell & Widen, 2002a, 2002b; Widen & Russell, 2010; Wilson-Mendenhall et al., 2011).

A Modern Psychological Constructionist Approach

My own lab is part of the endeavor to validate a psychological constructionist model that can explain the great variability in emotional experience and perception that exists both within and between individuals. Like previous constructionist models, the approach we take emerged from the observation that 100 years of psychological research has yet to identify the discrete bodily (Barrett, 2006a; Cacioppo et al., 2000; Mauss & Robinson, 2009), facial (Barrett, 2006a; Cacioppo et al., 2000; Mauss & Robinson, 2009; Russell et al., 2003), behavioral (Barrett, 2006a; Mauss & Robinson, 2009), or neural (Barrett & Wager, 2006; Kober et al., 2008; Lindquist, Wager, Kober et al., 2012) basis of English emotion categories such as "anger," "disgust," "fear," "happiness," and "sadness." Rather than revealing evidence for natural kinds of emotion, measures of the peripheral nervous system (e.g., cardiovascular reactivity, skin conductance, respiration) instead indicate whether a person is feeling positive or negative, activated or deactivated, or whether the person will approach or avoid something (Barrett, 2006a; Cacioppo et al., 2000; Mauss & Robinson, 2009). Facial muscle movements, as measured by electromyography, indicate whether someone feels positive or negative (Barrett, 2006a; Cacioppo et al., 2000; Mauss & Robinson, 2009). Brain activity that is correlated with emotion experience and perception does not reveal evidence for modular brain regions that have consistent and specific activity during instances of any one emotion category (Lindquist, Wager, Kober et al., 2012). Instead, these brain regions include areas that are involved in more basic psychological processes such as visceromotor control, the representation of hedonic value, the representation of concepts and knowledge, and executive control (Kober et al., 2008; Lindquist & Barrett, 2012; Lindquist, Wager, Kober et al., 2012). The networks that support these more basic psychological processes are also involved during myriad other mental states (including "cognitions"; Oosterwijk et al., 2012) and comprise the intrinsic functional organization of the human brain (Lindquist & Barrett, 2012).

The scientific observation that specific bodily, facial, vocal, behavioral, or brain activity does not correlate with discrete emotions appears to be inconsistent with the (very real) experiences that all healthy human beings have on a daily basis: discrete emotions appear on the faces and bodies of our spouses, children, and even pets, and characterize our own physical and mental reactions to the world. Psychological constructionism thus describes the mechanisms by which basic psychological ingredients combine to give us such discrete perceptions and experiences of emotion. According to our approach, emotions emerge in consciousness when people categorize ambiguous internal (i.e., bodily) and external (i.e., visual, auditory, tactile, etc.) sensations as instances of discrete emotion categories (e.g., anger). This could easily be called a "perception" of the body insofar as every visual perception involves making meaning of ambiguous visual sensations through the use of context (Bar, 2009).[7] Because emotion construction is so heavily dependent on the context, emotions are sometimes referred to as situated conceptualizations (cf. Barrett, 2009; Barsalou, 2009; see Figure 2), meaning that the experiences are tailor-made for interacting with current situations.[8] The ability to transform core affective changes into emotion likely evolved so that humans could better communicate, predict, and perhaps regulate the underlying core affective reactions of themselves and others.

There are multiple metaphors that describe the sort of emergentism that my lab's constructionist model proposes, but the one that I find most useful is a culinary metaphor. Just as gastronomic delights such as croissants, brioche, tarts, cookies, sauces, and puddings emerge from the combination of basic ingredients (flour, water, salt, etc.), we hypothesize that emotions such as anger, disgust, fear, happiness, and sadness emerge from the combination of more basic "psychological ingredients." The two psychological ingredients that our model emphasizes are *core affect* and *conceptualization.* Elsewhere, I have hypothesized other basic ingredients, such as sensations from outside the body (exteroceptive sensations) and executive control (for an extended discussion of all hypothesized ingredients, see Lindquist & Barrett, 2012; Lindquist, Wager, Bliss-Moreau et al., 2012; Lindquist, Wager, Kober et al., 2012).

Core Affect

The first ingredient in my psychological constructionist approach is called *core affect*. Core affect is a basic process that represents bodily (interoceptive) sensations. Core affect can be experienced as a bodily symptom (e.g., a beating heart), but is often experienced as feelings of pleasure/displeasure with some degree of arousal. Traditionally, this ingredient has been called "core" affect because the dimensions of valence and arousal underlie all discrete emotional experiences and perceptions. Self-reports of discrete emotion experiences and perceptions differ mathematically in terms of these two dimensions; despite being experienced as unique, individual emotion categories (e.g., anger, disgust, fear, happiness, sadness, etc.) do not form their own unique dimension in multidimensional space (Barrett & Russell, 1999; Kuppens, Tuerlinckx, Russell, & Barrett, in press; Russell & Barrett, 1999). Core affect can also be considered "core" in the sense that it represents sensations from the core of the body (Barrett & Bliss-Moreau, 2009; Russell, 2003; Russell & Barrett, 1999), which allow organisms to know whether to approach or avoid objects, people, places, etcetera (Barrett & Bliss-Moreau, 2009). As such, core affect can be thought of as a "common currency" for comparing the value of otherwise dissimilar stimuli (Cabanac, 2002).

Almost all psychological constructionist models hypothesize an ingredient involving representations of the body. My hypotheses about core affect draw not only from these prior approaches and existing psychological data, but also from the neuroscience data, which suggest that core affect derives from brain systems involved in visceromotor control and brain systems involved in representing afferent changes from the body.

Neuroanatomy. Growing evidence suggests that brain networks involved in visceromotor control (including the central nucleus of the amygdala, the nuclei of the basal ganglia, the periacqueductal gray, and the subgenual anterior cingulate cortex) are important to the generation of core affective feelings (for reviews, see Barrett & Bliss-Moreau, 2009; Barrett, Mesquita et al., 2007; Lindquist & Barrett, 2012; Lindquist, Wager, Kober et al., 2012; Wager et al., 2008). These brain areas show consistent increases in activity across studies of emotion and affect (for recent meta-analyses, see Kober et al., 2008; Lindquist, Wager, Kober et al., 2012; Vytal & Hamann, 2010; Wager et al., 2008), and electrical or chemical stimulation of these areas in mammals activates the sympathetic nervous system (Ángyán, 1994; Carrive, Dampney, & Bandler, 1987; Hardy & Holmes, 1988; Kapp, Gallagher, Underwood, McNall, & Whitehorn, 1982). Consistent and specific correlations between sympathetic nervous system patterns and discrete emotion are not routinely observed in humans; however, some aspects of sympathetic activity (e.g., facial electromyography, blood pressure, cardiac output, heart rate, skin conductance duration) correlate with feelings of valence, and other aspects (e.g., skin conductance level; Barrett, 2006a; Cacioppo et al., 2000; Mauss & Robinson, 2009) correlate with feelings of arousal.

Another set of brain regions represents afferent information from the sympathetic nervous system as core affective feelings. The orbitofrontal cortex (OFC), for instance, has been extensively linked to the representation of hedonic valence (Kringelbach & Rolls, 2004). Medial portions of the OFC receive projections from brainstem areas involved in visceromotor control (e.g., An, Bandler, Ongur, & Price, 1998), so it is possible to think of this region as an area that helps represent the affective meaning of afferent information from the body. Consistent with this interpretation, the medial (m) OFC and the rest of the ventromedial prefrontal cortex (of which mOFC is a part) is thought to help the brain make predictions about the affective meaning of sensations (e.g., visual sensations; Bar et al., 2006) using representations of prior experiences (Barrett & Bar, 2009; Roy et al., 2012; Shenhav, Barrett, & Bar, 2013). The hedonic value of afferent information from the body might therefore derive in part from how those bodily states were experienced as valenced in a previous context.

The anterior insula is another brain region that appears to be involved in representing sensations from the body as affective feelings. The anterior insula is a "hotspot" in the brain that shows increased activity across studies of pain, language, attention, emotion, time perception, and myriad other conscious states (Craig, 2009; Nelson et al., 2010). The ventral portion of the anterior insula is part of a so-called "salience network" (cf. Seeley et al., 2007) that correlates with participants' reports of arousal as they view evocative pictures (Touroutoglou, Hollenbeck, Dickerson, & Barrett, 2012). The ventral anterior insula has robust connections to the dorsal anterior insula, which directs attention based on body-based information (Nelson et al., 2010). The anterior insula might thus be the conduit through which core affective information from the body is used to guide attention and behavior.

The psychological origin of core affect. Neuroanatomy clearly points to biological systems involved in the generation and representation of core affective states, but a common critique by appraisal researchers is that core affect seems to have no *psychological* cause (Sander, 2012). There are two answers to this critique. The first is that it is not really useful to discuss a distinct psychological mechanism that turns core affect on and off, because core affect does not turn on and off. Core affect is the result of being an embodied organism and is inextricably intertwined with consciousness (also see Duncan & Barrett, 2007b; Russell, 2005). It arises from the biological (proprioceptive, kinesthetic, somatovisceral, neurochemical) mechanisms that support homeostasis. An organism is thus always in a core affective state, even if that core affective state is relatively neutral.

On the other hand, it is possible to discuss the psychological causes of *changes* in core affective feelings, but the point is that the causes of these changes are not themselves always psychological in nature. Core affective changes might occur because there is a release of reproductive hormones when an organism detects the pheromones of a mate, because proinflammatory neuropeptides are released following a bacterial infection, because the baroreflex changes as the position of the body is moved, or because blood glucose levels change after nutrients are consumed. These types of core affective changes are not typically of interest to psychology, although I would argue that they should be.

Of more interest to psychology is how external stimuli can cause changes in core affect. According to my approach, stimuli cause changes in core affect via the basic principles of associative learning. Very few stimuli in the external world possess intrinsic affective value (save a few so-called "prepared" stimuli that act directly on the nervous system, e.g., bright lights, loud sounds, nocioceptive stimuli that cause cell damage; molecules imperative to survival such as water and glucose). The core affective value of stimuli is thus learned over time via the principles of associative learning (Barrett & Bliss-Moreau, 2009; Bliss-Moreau, Barrett, & Wright, 2008). An unconditioned response (pain) might get paired with a conditioned stimulus (fire) over time, such that the conditioned stimulus comes to possess core affective value (negativity). In other instances, a stimulus might be associated with core affective value via purely symbolic means (e.g., a father tells his child that the fire is negative). If core affect is based in basic biochemical systems, and intrinsic or learned associations can cause shifts in core affect, then it is likely that all organisms possess core affect.[9] Of course, emotions are more than core affect alone. I hypothesize that discrete emotions are experienced when core affective feelings combine with another basic psychological ingredient called *conceptualization*.

Conceptualization

Conceptualization is the process by which the ebb and flow of sensations from inside the body (i.e., core affect) and outside the body (i.e., exteroceptive sensations) are made meaningful

(Barrett, 2006b, 2009, 2012; Lindquist & Barrett, 2008a, 2008b; Lindquist, Wager, Kober et al., 2012; Wilson-Mendenhall et al., 2011). All psychological constructionist models hypothesize an ingredient such as conceptualization that transforms core affect into instances of discrete emotion ("interpretation," Duffy, 1941; "cognition of the external stimulus and its meaning," Harlow & Stagner, 1932; "attribution," Russell, 2003; "situation-specific cognition," Schachter & Singer, 1962; e.g., "ideas," Wundt, 1897/1998). In my approach, conceptualization is synonymous with categorization and relies on representations of prior experiences (i.e., knowledge, concepts, episodic memories). These prior experiences are represented as situation-specific reenactments of emotion in the brain's sensorimotor cortices (Barrett, 2006b, 2009; Barrett & Lindquist, 2008; Wilson-Mendenhall et al., 2011). This so-called "embodied" (Barsalou, 1999, 2009; Barsalou, Kyle Simmons, Barbey, & Wilson, 2003) account of emotion knowledge means that emotion concepts—what someone knows about emotion—are represented in part by the same neural substrates that have increased activity when a person actually experiences core affective feelings, engages in behaviors, and perceives sensory stimuli (Barrett & Lindquist, 2008). The process by which conceptual knowledge transforms core affective feelings into discrete emotions is automatic, quick, and implicit. It could be argued that this transformation is one of the human brain's most impressive feats—turning a cacophony of body sensations, sounds, sights, and smells into coherent and bounded experiences of emotions, human voices, colors, and scents.[10]

Importantly, my constructionist account hypothesizes that the knowledge brought to bear during conceptualization is supported by language (Barrett, 2006b; Barrett, Lindquist, & Gendron, 2007; Gendron et al., 2012; Lindquist & Barrett, 2008b; Lindquist & Gendron, 2013; Lindquist, Wager, Kober et al., 2012). Just as infants routinely use words to bind perceptually dissimilar novel objects (e.g., a toy fish and dog) into categories (e.g., Dewar & Xu, 2009; Ferry, Hespos, & Waxman, 2010; Xu, 2002), I hypothesize that adults use words to glue variable experiences into "anger," "fear," "disgust," etcetera. Emotion words themselves serve as "essence placeholders" (cf. Medin & Ortony, 1989) for emotion categories because emotion exemplars have too few statistical regularities to constitute a perceptual category (Barrett, 2006a; Mauss & Robinson, 2009). Indeed, emotion categories might be acquired in childhood by bootstrapping situations and core affective feelings to the words used by adult caregivers (e.g., when mom and dad tell Joey not to be "sad" because of a broken toy, Joey learns that negative feelings following a loss are associated with the category "sadness" in his culture). As only humans possess language, humans might be uniquely able to experience discrete emotions (although it remains to be seen if animals with rudimentary concepts might be able to experience a rudimentary form of discrete emotions). Recent neuroanatomical evidence is consistent with this idea, since brain regions involved in memory and language support conceptualization in emotion.

Neuroanatomy. Growing evidence suggests that brain areas involved in reconstituting prior experiences for use in the present are active during emotion experience and perception. This set of brain regions is called the episodic memory network (Vincent et al., 2006) or the default network (Raichle et al., 2001) and includes the dorsal and ventromedial prefrontal cortex, medial temporal lobe (hippocampus, entorhinal cortex), precuneus, ventrolateral prefrontal cortex, anterior temporal lobe, and temporo-parietal junction (Kober et al., 2008; Lindquist, Wager, Kober et al., 2012; Vytal & Hamann, 2010). This network of brain regions shows increases in activity when people recall the past, imagine the future, make context-sensitive predictions about others' thoughts and feelings (for a meta-analysis, see Spreng, Mar, & Kim, 2009), use semantic memory (for a meta-analysis, see Binder, Desai, Graves, & Conant, 2009), or make meaning of exteroceptive sensations (e.g., in context-sensitive visual perception; Bar et al., 2006). The lateral aspects of this network, such as the anterior temporal lobe and ventrolateral prefrontal cortex, are linked to language representation (Binney, Embleton, Jefferies, Parker, & Lambon-Ralph, 2010), and retrieval (Schnur et al., 2009). These findings are thus consistent with the hypothesis that concept knowledge of emotion is in part supported by emotion words. Furthermore, ventrolateral prefrontal cortex activity increases when individuals focus attention on their core affective states (Lindquist, Wager, Kober et al., 2012), consistent with the idea that linguistic concepts help to make meaning of core affective states during emotion. Similarly, there is greater activity in anterior temporal lobe regions involved in concept representation when participants experience a discrete emotion as compared to when they experience a general body state (Oosterwijk et al., 2012).

Conceptual locus. According to my constructionist approach, how people use conceptual knowledge during the construction of emotion shapes the resulting emotion. When someone has an emotional experience, we typically assume that it is "self-focused" (e.g., I'm feeling angry; I'm feeling afraid). Yet people also experience "world focused" emotions in which emotions are experienced as a property of the world (e.g., my boss is a jerk; the dark alley is threatening). Following philosophical arguments about consciousness (Chalmers, 1996; Lambie & Marcel, 2002) and older models of emotion (Dewey, 1895), my approach thus considers world- and self-focused emotion to be two different varieties of emotional experience that might differ systematically across contexts. World-focused emotion might occur in instances where exteroceptive sensations, as opposed to bodily sensations, are at the forefront of awareness (e.g., the snake you just noticed on the path is threatening). Self-focused emotions might be more likely to occur in social contexts where a person has an implicit motivation to communicate his or her feelings (e.g., I feel anxious before the presentation).

Individuals could also differ in the extent to which they characteristically experience self- versus world-focused emotions, and this might have consequences for well-being. One hypothesis is that individuals who characteristically experience

emotions in a self-focused manner are better at regulating their emotions. Importantly, the distinction between self- and world-focused emotion helps deal with criticisms that psychological constructionist approaches exclusively operationalize emotions as self-conscious feelings that are available via self-report as emotion adjectives.[11] According to my model, a person could experience the world-focused emotion that their boss is a jerk and aggress without having the second-order experience of feeling "angry."

Empirical Support for a Modern Psychological Constructionist Account

Growing evidence supports the hypothesis that a person experiences an emotion when core affect and conceptualization combine in a given context. For instance, participants who feel unpleasant core affect in the presence of accessible knowledge about "fear" are more likely to experience the world as full of risk than participants who feel unpleasant in the presence of accessible knowledge about anger, participants who feel just unpleasant, or participants who feel neutral in the presence of accessible knowledge about "fear" (Lindquist & Barrett, 2008a). I have replicated this effect in several additional studies, in which core affect and conceptual knowledge were combined to produce the experience of pride and anger (Lindquist, Mendes, & Barrett, 2013). My colleagues and I have also demonstrated that the brain networks I associated with core affect and conceptualization in the previous lines show increased activity when a person experiences an emotion in real time in the fMRI scanner (Oosterwijk et al., 2012; Satpute, Shu, Weber, Roy, & Ochsner, 2013; Wilson-Mendenhall et al., 2011).

If core affect and conceptualization are necessary to experience a discrete emotion, it follows that disruption of one or both will prevent experiences of discrete emotions. Although the relevant research has yet to be done in the domain of emotion experience, findings on the perception of emotion on other people's faces are instructive. Temporarily removing access to conceptual knowledge about emotion by having participants repeat a relevant emotion word (e.g., "anger") out loud 30 times (a technique called "semantic satiation") hinders participants' subsequent ability to judge that two angry faces match in emotional content (Lindquist et al., 2006). Semantically satiating a relevant emotion word (e.g., "anger") prior to the perception of a face (e.g., an angry face) also impairs that face's ability to perceptually prime itself on a subsequent presentation (Gendron et al., 2012). Conceptually replicating these findings, patients with semantic dementia (who have impaired access to conceptual knowledge following neurodegeneration in the left anterior temporal lobe) cannot perceive discrete emotion on faces. Rather than sorting posed facial behaviors depicting six emotion categories into six distinct piles in a free-sort task, patients instead sort faces into piles representing positive, negative, and neutral valence (Lindquist, Gendron, Barrett, & Dickerson, 2013). Unlike the neuroimaging findings showing that brain regions involved in language are also involved in emotion, these behavioral tasks more clearly document the role of language in emotion by showing that language influences emotion perception, even on perceptual tasks that do not explicitly require the use of language.

Novel Predictions and Future Directions

Psychological constructionist approaches such as the one I have outlined here provide a promising paradigm for understanding emotion, but much work remains to validate and refine this approach. For instance, future research in my lab, and I hope elsewhere, will continue to explore the dynamics of emotion construction. Although constructionist models traditionally discussed meaning making as occurring well after the experience of an affective state (Duffy, 1941; Russell, 2003; Schachter & Singer, 1962), my model relies on the principles of constraint satisfaction (Read, Vanman, & Miller, 1997), assuming that core affect and conceptualization have a nonlinear influence on each other. This means that changes in core affective representations and conceptual representations are often co-occurring and mutually constraining one another. Although the relevant research has yet to be conducted, the literature on vision is instructive. Within 100 ms of light waves contacting the retina, visual sensations are fed forward to prefrontal areas involved in conceptualization (e.g., the OFC; Lamme & Roelfsema, 2000). This means that conceptualization is occurring even before a person has a conscious experience of visual sensations, at which point it has the opportunity to feed back and potentially even change the visual representation. If the same is the case in emotion, then conceptualization is constraining core affect well before a person is consciously aware of having internal sensations.

Another remaining question is how alterations in one or several psychological ingredients can alter emotional experiences in any given instance (just as increasing the amount of salt and flour in a recipe changes the resulting product). Because the core affective system operates in part via the same neural and neurochemical systems that subserve immune function and behavior, a novel prediction of my psychological constructionist approach is that body changes that are unrelated to the immediate situation (e.g., neuropeptide release related to infection; heart rate changes related to a baroreflex response; hormonal changes related to diurnal rhythms) can contribute to the experience of emotion. Existing evidence suggests that changes in proprioception (Stepper & Strack, 1993), facial muscle movements (Strack, Martin, & Stepper, 1988), peripheral physiology (Dutton & Aron, 1974), and even individual differences in awareness of one's own body changes (Barrett, Quigley, Bliss-Moreau, & Aronson, 2004; Hantas, Katkin, & Blascovich, 1982) alter a person's experience of emotion. It thus follows that any neurochemical changes related to homeostasis have the potential to alter emotion experiences (even if those changes are not necessarily related to an emotional context). This avenue of research has important implications for a host of conditions in which there are alterations in core affective responding such as mental illness (e.g., anxiety disorders), physical illnesses (e.g., cancer), and even aging (in which people become less aware of bodily changes; Mendes, 2010).

Another question important to validating and extending a psychological constructionist hypothesis concerns how individual differences in conceptual knowledge shape emotional experiences. Evidence shows that children who do not yet know certain linguistic emotion concepts cannot perceive those emotions on others' faces, even in tasks that do not explicitly require language (Widen & Russell, 2008). It follows that the content and complexity of an adult's concept knowledge about emotion will shape how he or she experiences his or her core affective states as instances of discrete emotions. It is possible that individuals who possess more complex knowledge of emotions (perhaps acquired in part from discussions with a parent as a child; Fivush, Berlin, Sales, Mennuti-Washburn, & Cassidy, 2003) will experience more nuanced and complex emotions that are more appropriate to the context. This avenue of research has important implications for emotional well-being, insofar as experiencing affective states as instances of discrete emotions is related to self-regulation (Lindquist & Barrett, 2008b).

Implications of a Constructionist Approach for the Science of Emotion and Beyond

A common critique of my psychological constructionist approach, and constructionism in general, is that it explains emotions out of existence. Although some psychological constructionists have in fact argued that emotions are illusions that scientists should do away with (Duffy, 1934), my constructionist approach takes a more productive approach. It does not assume that emotions are illusions—they do not emerge out of thin air, because there are physical constraints that reliably underlie them (i.e., all measures of emotion find evidence for core affect; for reviews, see Barrett, 2006a; Lindquist, Wager, Kober et al., 2012; Mauss & Robinson, 2009). The role of psychology is thus to explain how the emotions that people experience emerge from these physical constraints. In doing so, the psychological constructionist approach that I take thus cautions us not to take our own experiences of the world too seriously—as scientists, we should not confuse the content of mental experience (e.g., the experience of anger when the dishwasher breaks) for a process (e.g., evidence that there is a mechanism for all instances of "anger"). In the same vein, although instances of emotion correspond to a brain state, this does not mean that the brain regions with increased activation during an emotion experience represent the anatomically given circuit for that particular emotion category. Neural activity should instead be thought of as a snapshot in time of a particular combination or "recipe" of networks that correspond to basic psychological ingredients.

In much the same vein, the constructionist approach I take also cautions drawing firm boundaries between mental states just because we experience them as distinct. The brain-based evidence demonstrates that core affective representations contribute to a host of other mental states including, but not limited to, emotions, thoughts, and body feelings (e.g., Oosterwijk et al., 2012). The fact that sensations from the body form a basic psychological ingredient that contributes to all mental states, begins to break down distinctions between commonsense categories such as "affect" and "attention" (Duncan & Barrett, 2007a, 2007b) or even "emotion" and "cognition," more broadly (Duncan & Barrett, 2007a; Pessoa, 2008). The brain-based and behavioral evidence I have discussed here further underscores the idea that "cognition" and "emotion" are not distinct processes: traditionally "cognitive" processes (representations of prior experiences, language) are constitutive of emotional experiences (Lindquist & Barrett, 2008a; Lindquist, Wager, Kober et al., 2012; Oosterwijk et al., 2012).

Although mental state categories such as "anger," "disgust," "fear," "memory," "thoughts," or even "emotion" and "cognition" might not be entities, they are important mental events that should be studied. In the emotion literature, this is where psychological constructionism makes contact with other models. Emotions clearly evolved for a purpose—even if what evolved was not necessarily a modular package, but more basic processes that combine in humans to produce flexible reactions to the world around us. Emotions are also real events (even if the kind of "real" we are talking about has social rather than biological ontology; Barrett, 2012) that, once formed, can have important downstream consequences for social behavior (DeSteno, Dasgupta, Bartlett, & Cajdric, 2004), relationships (Algoe, Gable, & Maisel, 2010), decision-making (Lerner & Tiedens, 2006), and even health (Algoe & Stanton, 2012; Catalino & Fredrickson, 2011). By telling your loved one that you are feeling an instance of pride, you are communicating something about your internal state and its relationship to the environment, and perhaps even something about the actions you might take next. The ability to construct emotion might thus be one of human beings' most adaptive traits. Continued understanding of this process will help scientists begin to understand the basis of all human experiences, and to better understand how and when disorder in those experiences occurs.

Notes

1 Technically, several philosophers articulated psychological constructionist models before James, although this occurred before psychology was formalized as a scientific discipline. The philosopher Herbert Spencer (1855/1998), for instance, crafted a psychological constructionist model of emotion in which he argued that emotions do not differ from cognitions (even if people experience them as distinctly different states). This view shares much in common with modern constructionist views which suggest that emotions, cognitions, and perceptions are all constructed out of the same domain-general mental ingredients (e.g., Oosterwijk et al., 2012).

2 Ironically, Darwin (1872/1965) did not argue that emotions were adaptive behaviors. He instead assumed that the behaviors associated with certain internal feeling states were vestiges that used to be useful to an organism (perhaps even more ironically, he used principles of Lamarkian evolution to make this argument).

3 Causal appraisal models of emotion make natural kinds assumptions (see Barrett, 2006a, for a detailed discussion) but constitutive appraisal models do not. Although it is beyond the scope of this article to discuss all aspects of appraisal models in detail, they are another important genre of emotion model that has existed since the beginning of psychology (see Gendron & Barrett, 2009).

4 Indeed, even so-called basic emotion approaches now hypothesize a role for appraisals in emotion generation (Ekman & Cordaro, 2011). Unfortunately, hypothesizing a role for appraisals still does not account for the observation of so much within-emotion category variance, however (e.g., why two instances of anger can look and feel so different).

5 As testament to the similarity, Clore and Ortony (2013) now refers to his approach as a constructionist approach.

6 Save Schachter and Singer's famous (1962) study, which has been difficult to replicate. Furthermore, testing the idea that people can make meaning of ambiguous arousal after the fact is not ultimately the best test of a constructionist approach (for a discussion, see Lindquist & Barrett, 2008a).

7 Although it is beyond the scope of this article to discuss the perception of emotion in others' faces, voices, and bodies in depth, I hypothesize that a comparable constructive process occurs when perceiving emotion in someone else: perceptions of discrete emotions occur when affective changes in someone else's behavior are made meaningful using representations of prior experiences and sensory perceptions of the current context (Lindquist & Gendron, 2013).

8 The idea of situated conceptualizations differs from other embodied simulation models (e.g., Damasio 2000; Niedenthal 2007) which assume that emotions are biologically basic categories with distinct somatic markers.

9 Questions remain about the extent to which animals can represent core affective states, however. For instance, most mammalian brains do not include the anterior aspects of the insula that are thought to give rise to second-order consciousness of body states in humans (Craig, 2009).

10 This idea shares much in common with concept of the "predictive brain" that is discussed in contemporary cognitive neuroscience (cf. Bar, 2009; Brown & Brune, 2012; Mitchell, 2009; Schacter, Addis, & Buckner, 2008).

11 Other approaches argue for the existence of "implicit" emotions, in which a discrete emotion can operate on behavior without conscious awareness. Yet there are several problems with this hypothesis. First, there is no objective way of knowing what emotion a person is feeling—measurements from the body, brain, behavior, or facial muscle movements cannot specify which discrete emotion a person is feeling (Barrett, 2006a; Cacioppo et al., 2000; Mauss & Robinson, 2009). Moreover, showing that a person performs a behavior is not sufficient evidence to conclude that he is experiencing a specific emotion. Emotions are not behaviors and there are scientific and philosophical reasons for not reducing complex emotion categories to a single behavior (Barrett, Lindquist, Bliss-Moreau et al., 2007; LeDoux, 2012a, 2012b). Behaviors should instead be considered another ingredient that is sometimes (but not always) involved in constructing an emotion.

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