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Beyond Variability: A Causal Perspective on Basic Emotions

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ABSTRACT

This paper explores the debate between Basic Emotion Theory (BET) and Psychological Construction Theory (PCT) regarding the nature of emotions, focusing on the challenges PCT poses to BET's claims of universality, discreteness, and biological underpinnings. By examining empirical evidence and theoretical frameworks, this paper argues that the variability in emotional responses, often cited by PCT proponents as a challenge to BET, does not negate the existence of distinct basic emotions with biological foundations. Instead, the paper proposes a refined understanding of BET, emphasizing a causal perspective that focuses on the underlying mechanisms of emotions rather than solely on fixed physiological signatures.

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Introduction

Emotions, intricate and potent forces woven into the fabric of human experience, have long fascinated philosophers, scientists, and laypeople alike. They profoundly influence our lives, shaping our perceptions, decisions, and interactions with others. From fleeting moments of joy to prolonged periods of sadness, emotions serve as a fundamental aspect of our existence, guiding us through life's complexities and fostering social connections.

Yet, beneath the surface of this emotional complexity lies a profound intricacy. The fundamental nature of emotions—their origins, constituent elements, and purposes—remains a subject of ongoing debate and investigation. Are emotions innate, biologically determined responses, or are they flexible constructs molded by individual experiences, cultural norms, and social context? These questions have fueled a rich and multifaceted discourse, with various theoretical perspectives competing for dominance.

Basic Emotion Theory (BET) has long served as a cornerstone in the field of emotion research, providing a foundational framework for understanding the nature and origins of emotions. Early pioneers like Tomkins (1962, 1963) laid the groundwork for BET by proposing that a limited set of discrete, universal emotions—such as joy, anger, fear, sadness, and disgust—are biologically ingrained in humans, transcending cultural and individual differences. Tomkins's research on facial affect, particularly his identification of nine innate affects, laid the groundwork for further investigation into the biological basis of emotions.

Ekman's groundbreaking cross-cultural studies on facial expressions (Ekman & Friesen, 1971) provided strong evidence for the universality of basic emotions. His research showed that people from different cultural backgrounds exhibit similar facial expressions when experiencing core emotional states. Building on this, Izard's Differential Emotions Theory (Izard, 1977, 1991) further developed BET by suggesting that basic emotions have distinct motivational properties and adaptive functions. His theory, supported by extensive research on infant emotional development (Izard et al., 1980), highlighted the importance of basic emotions in early social and cognitive development.

However, BET has faced challenges. Psychological Construction Theory (PCT), proposed by Barrett (2006a, 2006b, 2017), challenges some of BET's core assumptions. PCT posits that emotions are not innate and universally expressed but are constructed in the moment through a dynamic interplay of core affect (basic, underlying feelings of pleasure or displeasure), sensory input, and conceptual knowledge. This theory argues against discrete, biologically determined emotional categories, suggesting instead that emotions are emergent phenomena shaped by individual experiences, cultural influences, and linguistic practices. PCT emphasizes interoception—the perception and interpretation of bodily sensations—as crucial in constructing emotional experiences (Barrett & Simmons, 2015). By presenting a more fluid and context-

dependent model of emotions, PCT has prompted researchers to re-examine long-held assumptions about the nature and origins of emotions.

This paper critically examines the challenges posed by Psychological Construction Theory (PCT) to Basic Emotion Theory (BET), particularly focusing on the contested notions of emotional universality, discrete emotional categories, and the biological underpinnings of emotions. While acknowledging the valuable contributions of PCT, this paper aims to demonstrate that BET remains a robust framework for understanding emotions. By reframing the concept of emotional categories and adopting a causal perspective, the variability in emotional responses often cited as a challenge to BET will be addressed. Through an examination of empirical evidence, a refined BET framework is suggested that acknowledges both the universal biological basis of emotions and the influence of individual and contextual factors on emotional expression and experience.

1. The Basic Emotion Theory (BET)

Basic Emotion Theory (BET) finds its roots in Charles Darwin's evolutionary framework. In his work, "The Expression of the Emotions in Man and Animals" (1872), Darwin proposed that emotions are not unique to humans but shared across species, serving essential adaptive functions for survival and communication. This challenged the then-dominant view that emotions were solely a human trait and laid the groundwork for BET, suggesting that certain emotions might be biologically innate and universal across cultures (Ekman, 1992).

Darwin's observations on the striking similarities in emotional expressions across diverse human populations and even among certain animals provided the first empirical evidence for the potential universality of emotions (Darwin, 1872). He meticulously documented facial expressions associated with emotions like fear, anger, and joy, noting their consistent manifestation across individuals from different cultural backgrounds. These observations, though limited by the methodological constraints of his time, planted the seeds for the concept of basic emotions that subsequent researchers would later formalize and expand.

Building upon Darwin's foundation, Silvan Tomkins, Paul Ekman, and Carroll Izard emerged as key figures in developing Basic Emotion Theory (BET). Tomkins's research on facial expressions identified nine innate affects, suggesting a biological basis for emotions. Ekman's cross-cultural studies narrowed this to six basic emotions: happiness, sadness, anger, fear, disgust, and surprise (Ekman & Friesen, 1971). His findings provided compelling evidence for the universality of these emotions, showing that individuals from diverse cultures exhibit similar facial expressions when experiencing these core emotional states. Izard's Differential Emotions Theory (1977, 1991) further expanded BET by proposing that each basic emotion has distinct motivational and adaptive functions. This theory, supported by research on infant emotional development (Izard et al., 1980), highlighted the importance of basic emotions in early social and cognitive development.

Building upon the foundational work of Darwin, Tomkins, and Ekman, Basic Emotion Theory (BET) became a dominant framework in emotion research during the mid-20th century. BET rests on several key principles that have shaped our understanding of emotions:

1. **Discrete Emotions:** BET proposes that emotions can be grouped into a small set of fundamental, distinct categories. These are often identified as joy, sadness, anger, fear, disgust, and surprise (Ekman, 1992; Izard, 2007). While acknowledging the existence of complex emotions, BET suggests that these are combinations or variations of the basic emotions.
2. **Universality:** A central tenet of BET is the universality hypothesis, which asserts that basic emotions are not culturally bound but are innate and biologically hardwired in humans (Ekman, 1994). This implies that individuals from diverse cultural backgrounds experience and express these basic emotions in fundamentally similar ways. Ekman and Friesen's (1971) cross-cultural studies on facial expressions provide compelling evidence for this claim.
3. **Distinct Physiological and Expressive Characteristics:** BET suggests that each basic emotion is associated with a unique pattern of physiological responses, including changes in heart rate, blood pressure, and facial muscle activity (Levenson, Ekman, & Friesen, 1990). Additionally, each emotion is thought to have a specific facial expression that is universally recognized, serving as a reliable indicator of the underlying emotional state (Ekman & Friesen, 1975)
4. **Adaptive Function:** BET emphasizes that basic emotions have evolved to serve adaptive functions in human survival and social interaction. For instance, fear signals danger and triggers fight-or-flight responses, while joy promotes social bonding and cooperation (Keltner & Kring, 1998).

Research across different fields supports BET's claims. Cross-cultural studies, exemplified by the pioneering work of Ekman and Friesen (1971), have consistently demonstrated a high degree of agreement in recognizing and expressing basic emotions through facial expressions. Even individuals from remote, isolated cultures with minimal exposure to Western media reliably identify and produce facial expressions associated with emotions like happiness, sadness, anger, fear, disgust, and surprise. These findings support the universality hypothesis of BET, suggesting that these emotions are not merely cultural artifacts but reflect fundamental human experiences with biological underpinnings.

Further supporting the biological basis of basic emotions, neuroimaging studies have revealed distinct patterns of neural activation associated with different emotional states. For instance, fear consistently activates the amygdala, a brain region critical for threat detection and the fear response (Phelps & LeDoux, 2005). Disgust is linked to increased activation of the insula, a region involved in interoception and processing visceral sensations (Wicker et al., 2003). These neurobiological findings provide compelling evidence for the distinctness of basic emotions, indicating they have unique neural signatures.

Research on infant and child development also offers crucial insights into the origins of emotions. Studies have shown that even very young infants, before extensive social learning, exhibit distinct facial expressions and vocalizations associated with basic emotions (Izard et al., 1980). This early emergence of emotional expressions suggests that basic emotions are not solely the product of socialization but have a strong innate component, likely shaped by evolutionary pressures.

Evolutionary psychology provides a compelling framework for understanding the adaptive significance of basic emotions. From this perspective, emotions are not just subjective feelings but evolved adaptations that play a crucial role in human survival and reproduction (Tooby & Cosmides, 1990). Fear, for example, serves as an alarm system, alerting us to potential threats and activating physiological responses that prepare us for fight or flight (Ledoux, 1996). Positive emotions like joy and love promote social bonding, cooperation, and procreation, contributing to the survival and flourishing of our species (Keltner & Haidt, 1999). This evolutionary perspective explains the universality of basic emotions as fundamental adaptations shaped by natural selection to enhance survival and reproductive success.

The empirical evidence from cross-cultural studies, neurobiological investigations, and developmental research supports the theoretical foundations of Basic Emotion Theory (BET). These findings collectively suggest that basic emotions are not just cultural constructs but are deeply rooted in our biological makeup, serving essential adaptive functions across diverse human populations.

Despite this strong support, BET has faced significant challenges from alternative theoretical frameworks, particularly Psychological Construction Theory (PCT). Spearheaded by Lisa Feldman Barrett and colleagues, PCT emerged in the mid-2000s (Barrett, 2006a, 2006b), questioning some of BET's core assumptions and proposing that emotions are constructed through the dynamic interplay of core affect, sensory input, and conceptual knowledge. This theory suggests that emotions are emergent phenomena shaped by individual experiences, cultural influences, and linguistic practices.

2. Psychological Construction Theory (PCT): An Alternative Framework

Psychological Construction Theory (PCT), articulated by Barrett (2006a, 2006b, 2017) and Russell (2003), presents a direct and substantial challenge to the fundamental tenets of BET. Rather than viewing emotions as discrete, universal entities with specific biological signatures, PCT proposes that emotions are constructed in the moment through a dynamic interplay of core affect, sensory input, and learned conceptual knowledge.

In the constructionist view, emotions do not exist as distinct entities within the brain or body. Instead, they are seen as emergent phenomena arising from the interaction of more fundamental components. Central to this framework is the concept of "core affect," a basic neurophysiological state characterized by a blend of hedonic valence (pleasure-displeasure) and arousal (sleepy-activated) (Russell, 2003). Core affect represents the raw, undifferentiated feelings we experience,

which are then interpreted and categorized through conceptualization, drawing upon learned knowledge about emotions and associated bodily sensations. This process is heavily influenced by cultural and linguistic factors, leading to a wide range of possible emotional experiences.

PCT challenges BET's core assumptions by targeting the idea of a one-to-one correspondence between basic emotions and their physiological or behavioral manifestations. Proponents of PCT argue that empirical evidence does not support unique and invariant biological signatures for each basic emotion (Russell, 2003; Barrett, 2006a). They point out that the same physiological response, such as an increased heart rate, can be associated with various emotions, including fear, excitement, or anger, depending on the individual's interpretation of the situation. This variability in emotional responses, according to PCT, undermines the notion that emotions are discrete entities with distinct biological fingerprints.

Instead of viewing emotions as innate and categorically distinct, PCT suggests that they are constructed in the moment through the interaction of core affect and conceptual knowledge. This perspective emphasizes that the same underlying core affect can be interpreted and experienced as different emotions depending on the individual's understanding of emotions, their cultural background, and the specific social context. Thus, PCT offers a more nuanced and dynamic understanding of emotional experience, recognizing the role of both biological and psychological factors in shaping our emotional lives. This constructionist model directly challenges several key tenets of BET:

1. **Universality**: PCT contests the universality of basic emotions, arguing that the purported universality of facial expressions is overstated and that cultural variations in emotional experience and expression are substantial (Barrett, 2017; Gendron et al., 2014). Evidence from cross-cultural studies shows considerable variability in how emotions are conceptualized, labeled, and experienced across different societies. This challenges BET's claim that basic emotions are hardwired and expressed similarly across cultures.
2. **Discreteness**: PCT rejects the notion of discrete emotional categories, suggesting that emotions are not neatly packaged entities with clear boundaries. In contrast to BET's emphasis on distinct physiological and expressive characteristics for each basic emotion, PCT argues that emotional experiences are fluid, dynamic, and exist on a continuum, shaped by a complex interplay of biological, psychological, and social factors (Barrett, 2006a).
3. **Biological Determinism**: PCT challenges the idea that emotions are primarily driven by innate biological mechanisms. While acknowledging the role of physiological arousal in emotional experience, PCT emphasizes that this arousal is not specific to any particular emotion but rather provides a general sense of activation or deactivation (Barrett, 2017). According to PCT, it is the interpretation of this arousal through learned concepts and social context that gives rise to specific emotional experiences. This challenges BET's view that emotions are primarily triggered by specific biological mechanisms.

Psychological Construction Theory (PCT) is not merely a theoretical framework; it is supported by empirical evidence from various disciplines. Cross-cultural studies, for example, have consistently documented the significant influence of cultural context on the experience, expression, and categorization of emotions (Mesquita & Frijda, 1992; Gendron et al., 2014). These findings challenge the notion of universal basic emotions, suggesting that cultural norms, values, and linguistic practices play a significant role in shaping our emotional lives.

Developmental studies further support the constructionist perspective. Research shows that infants, while capable of expressing a limited range of emotions, do not possess fully formed emotional categories at birth (Widen & Russell, 2010). These categories gradually emerge and diversify through social interactions and language acquisition as children learn to label and differentiate their bodily sensations and experiences within their cultural context. This developmental trajectory suggests that emotional concepts are not innate but are acquired and refined over time through a dynamic interplay of biological predispositions and sociocultural learning.

Furthermore, neuroimaging studies have provided compelling evidence that challenges the idea of localized brain regions dedicated to specific emotions, as proposed by BET. Instead, emotions seem to involve a complex interplay of neural networks associated with interoception (the perception of bodily sensations), conceptualization (making meaning of sensations), and social cognition (understanding social cues and contexts) (Barrett & Satpute, 2013). This distributed nature of emotional processing challenges BET's notion of discrete neural signatures for basic emotions. For example, research has shown that the same pattern of brain activation can be associated with different emotions depending on the individual's interpretation of the situation (Wilson-Mendenhall et al., 2013). This finding further supports PCT's claim that emotions are constructed through a dynamic process involving both bottom-up bodily sensations and top-down cognitive appraisals.

The empirical evidence presented provides strong support for PCT, highlighting the significant influence of cultural context, individual experience, and conceptual knowledge on emotional experience. The cross-cultural variability in emotional expression and categorization, the developmental trajectory of emotional understanding in children, and the neuroimaging evidence of distributed neural networks involved in emotion processing all challenge the core assumptions of BET, particularly the notion of universal, discrete, and biologically determined emotions.

However, while PCT offers valuable insights into the complexity and variability of emotional experience, it is essential to critically evaluate the extent to which these findings truly undermine the fundamental tenets of BET. Can BET be reconciled with the evidence for cultural variability, individual differences, and the role of cognition in shaping emotions? Or does PCT represent a paradigm shift that necessitates a complete abandonment of the basic emotion framework? The following sections will delve deeper into these questions, exploring the potential limitations of PCT

and re-examining the evidence in support of BET to assess its continued relevance in the field of emotion research.

3. Revisiting Basic Emotion Theory

While PCT raises significant challenges, a closer examination of the evidence and theoretical foundations suggests that BET's core principles remain valid. This section addresses PCT's critiques, demonstrating how BET can be refined to accommodate the complex and dynamic nature of emotions. I argue that the evidence against a strict one-to-one correspondence between emotions and their physiological or behavioral expressions is not conclusive, with methodological limitations in some studies potentially overemphasizing variability. Importantly, I propose reframing the concept of basic emotions within a causal framework, where emotions are defined by their underlying mechanisms rather than rigid, essentialist properties. This approach allows for individual and cultural variations while acknowledging the biological grounding of basic emotions. I will first examine the variability in empirical findings, highlighting methodological limitations and inconsistencies that may have overstated the lack of specificity in emotional responses. Next, I will introduce the concept of causal mechanisms as a more promising framework for understanding emotions.

3.1. Variability in Empirical Evidence

A central critique from Psychological Construction Theory (PCT) against Basic Emotion Theory (BET) is that empirical evidence does not consistently support a direct, one-to-one correspondence between specific emotions and their physiological responses. PCT proponents, such as Barrett (2006a), often cite studies like Cacioppo et al. (2000), which found that both fear and excitement can elicit similar increases in heart rate and skin conductance. They argue this overlap challenges BET's notion of unique physiological signatures for each basic emotion.

Several methodological limitations raise concerns about the validity of these findings. Firstly, inconsistent experimental designs across studies investigating the relationship between emotions and physiological responses make it difficult to compare results. Some studies induce emotions using visual stimuli, such as pictures or films, while others use auditory stimuli or rely on participants' self-reported emotional experiences. These variations can lead to different patterns of physiological responses, complicating the drawing of firm conclusions about the specificity of emotions (Gross, Sutton, & Ketelaar, 1998; Kreibig, 2010). The method of emotion induction significantly influences the outcomes, affecting the reliability of cross-study comparisons.

Secondly, many studies focus on a limited number of physiological measures, such as heart rate and skin conductance, while neglecting other potentially relevant measures like facial muscle activity or respiratory patterns. This narrow focus can result in an incomplete picture of the physiological correlates of emotions, potentially obscuring subtle but important differences between emotions. As Cacioppo et al. (1997) emphasize, a more comprehensive approach utilizing multiple physiological measures is necessary to capture the complex nature of emotional responses.

Similarly, Stemmler (2001) highlights the importance of considering a wide range of physiological processes during emotional experiences to fully understand their complexity.

Another significant concern is the ecological validity of these studies. Most research on emotions is conducted in laboratory settings, which may not accurately reflect the complexity and dynamism of real-world emotional experiences. Gross et al. (1998) point out that emotions in everyday life are often influenced by social and cultural contexts, as well as individual differences in emotional expression and regulation. Consequently, the artificial nature of laboratory-induced emotions may limit the generalizability of findings to real-world situations. Field studies, such as those by Sbarra and Hazan (2008), which examine emotional responses in naturalistic settings, could provide more ecologically valid insights.

Finally, individual differences in physiological reactivity and emotional expressiveness must be considered. For instance, Feldman Barrett et al. (2007) found that individuals with alexithymia (difficulty identifying and describing emotions) exhibit atypical patterns of physiological arousal in response to emotional stimuli. This highlights the importance of accounting for individual differences in emotional processing when interpreting physiological data. Furthermore, studies by Gross et al. (1998) suggest that personality traits can significantly modulate emotional responses, indicating that individual variability must be factored into the analysis. Research by Kagan (1994) on temperamental differences also underscores the role of inherent individual variability in shaping emotional responses.

These methodological challenges suggest that the current evidence base for variability in physiological responses to emotions may be overstated. Further research with more rigorous and comprehensive methodologies is needed to determine the extent to which basic emotions have distinct physiological signatures. It is important to note that these methodological issues are not unique to studies testing BET but are pervasive in emotion science as a whole. For instance, difficulties in accurately measuring subjective emotional experiences and the complexities of inducing specific emotions in laboratory settings pose challenges across the field. My aim is not to leverage these challenges to prove BET's tenets but rather to highlight that the conclusions drawn by PCT proponents are not as decisive as they might appear.

Apart from the methodological issues, it is important to note that the evidence supporting variability is not as conclusive as often suggested. While some findings appear to support PCT's claim, a thorough review of the literature reveals inconsistencies. For example, Siegel et al. (2018) conducted a meta-analytic investigation of autonomic features of emotion categories, finding significant variability and overlap in physiological responses associated with different emotions. This study challenges the notion of unique physiological signatures for each basic emotion, highlighting the inconsistencies in findings that support the variability claim.

Mauss and Robinson's (2009) comprehensive review of emotion measurement also addresses these inconsistencies. While acknowledging challenges in isolating distinct physiological patterns

for basic emotions, they emphasize the need for a multi-faceted approach that considers the interplay of experiential, physiological, and behavioral responses. This suggests that distinct physiological patterns may still exist despite observed variability.

Lindquist et al.'s (2012) meta-analysis of neuroimaging studies presents a similarly complex picture. Their analysis found evidence for both distinct and overlapping neural activation patterns across emotions, with some emotions demonstrating more distinct patterns than others. While there is some overlap in neural activation, their findings underscore the consistent activation of specific brain regions in response to particular emotions, suggesting the presence of distinct neural correlates for basic emotions. This indicates that emotional processing involves a network of interacting brain regions rather than simple localized activation.

Furthermore, studies like Levenson et al. (1990) have demonstrated significant and consistent differences in autonomic nervous system activity for emotions such as anger, fear, sadness, and happiness, even when controlling for individual and contextual variability. Kreibig's (2010) extensive review also reveals that while some overlap in physiological measures across emotions exists, specific combinations and patterns can differentiate between emotions like fear, sadness, anger, and happiness.

Comprehensive meta-analyses, which synthesize results from multiple studies, offer a broader perspective on the physiological correlates of emotions. A notable example is the meta-analysis by Stemmler (2001), which examined physiological responses across six basic emotions. The analysis revealed distinct patterns of physiological arousal for each emotion, with specific combinations of heart rate, skin conductance, finger temperature, and facial muscle activity reliably differentiating between emotions like anger, fear, sadness, and happiness.

Converging lines of evidence from diverse domains of research also suggest a robust biological basis for basic emotions. For instance, Sauter et al.'s (2010) cross-cultural investigation of nonverbal vocalizations demonstrated high accuracy in recognizing basic emotions like anger, fear, disgust, sadness, and surprise across diverse cultures. This indicates that these emotions are not solely reliant on visual cues and may be communicated through inherent vocal patterns.

Neuroimaging studies have revealed striking cross-cultural similarities in the neural correlates of basic emotions. For example, Vytal and Hamann's (2010) meta-analysis found consistent activation of the amygdala, a key brain region implicated in fear processing, across Western and East Asian cultures in response to fearful stimuli. This suggests that the neural mechanisms underpinning the experience and recognition of basic emotions like fear may be conserved across cultures, highlighting a universal biological basis for these emotions that transcends cultural variations in expression and regulation.

The evidence we reviewed supports the existence of distinct physiological signatures for basic emotions. However, more importantly, it shows that the findings are not as conclusive as initially presented by PCT proponents. This suggests that inconsistencies across individual studies may be

due to methodological variations or specific contexts in which the data were collected, rather than a fundamental lack of differentiation between emotions at the physiological level. Therefore, a nuanced reconciliation between the observed variability and BET's assertion of distinct physiological patterns is necessary.

One crucial factor contributing to variability is cognitive appraisal. Cognitive appraisal theory, as proposed by Lazarus (1991), suggests that the way individuals evaluate and interpret a situation significantly influences their emotional response. The same physiological arousal, such as an elevated heart rate, can manifest differently depending on an individual's interpretation of the situation. For instance, a racing heart may be experienced as fear in a threatening context or as excitement in an exhilarating one (Lazarus, 1991). This process involves evaluating the personal significance of an event, which shapes the specific emotion experienced (Smith & Kirby, 2009). Thus, the subjective evaluation of the situation, rather than the physiological response itself, determines the specific emotion experienced.

Furthermore, social and cultural norms profoundly shape how individuals express their emotions outwardly (Mesquita & Frijda, 1992). These cultural factors may lead to variations in facial expressions, vocalizations, and other behavioral manifestations of emotions. However, these variations in expression do not necessarily imply differences in the underlying emotional experience. Instead, they represent culturally sanctioned ways of expressing or masking emotions that are fundamentally similar across cultures (Matsumoto, 1990).

In essence, while physiological responses to emotions may vary across individuals and contexts, these variations do not negate the existence of distinct physiological patterns associated with basic emotions. Instead, they highlight the complex interplay between biological predispositions, cognitive appraisals, and sociocultural influences in shaping emotional experiences. Put differently, BET's assertion of distinct physiological signatures for basic emotions is not irreconcilable with the observed variability.

This section has demonstrated that the observed variability in physiological responses to emotions can be attributed to methodological challenges, inconsistent evidence, and alternative factors such as cognitive appraisals and cultural norms. These considerations highlight that while there is variability, it does not entirely undermine the existence of distinct physiological patterns associated with basic emotions. BET's assertion of distinct physiological signatures for basic emotions can still hold, recognizing that these signatures are influenced by a multitude of factors. After explaining the variability, in the next section, we will explore causal mechanisms as a more promising framework for understanding emotions.

3.2. Beyond Essentialism: Basic Emotions as Causal Kinds

Critiques of Basic Emotion Theory (BET) often adopt an essentialist framework, which defines natural kinds by intrinsic, unchanging properties shared universally by all members (Kripke, 1980; Putnam, 1975). According to this view, natural kinds have a core essence that remains constant

across different contexts and instances. For example, water is defined by its chemical structure H2O, and gold by its atomic number 79. These properties are seen as defining features that all instances of water or gold must possess, regardless of external conditions or contexts. Applied to emotions, this perspective implies that each basic emotion, such as fear or joy, should have a unique and invariable physiological and neurological signature that is consistent across all individuals and situations.

The essentialist interpretation of BET, which posits that each basic emotion should have a unique and invariable physiological profile, is indeed challenged by the observed variability in emotional responses. As discussed previously, studies like Cacioppo et al. (2000) have shown that emotions like fear and excitement can elicit similar physiological responses, such as increased heart rate and skin conductance. This overlap in physiological arousal seemingly contradicts the idea that each basic emotion has a distinct and identifiable physiological profile, questioning the validity of BET under this framework (Barrett, 2006a). Additionally, studies have shown that the same physiological responses can be associated with different emotions depending on context and individual interpretation, further undermining the essentialist view (Russell, 2003).

However, the essentialist view is not the only way to understand natural kinds. An alternative perspective, known as the Homeostatic Property Cluster (HPC) theory, proposed by Boyd (1999), suggests that natural kinds are defined by clusters of properties that tend to co-occur due to underlying causal mechanisms. These properties may not be universally present in every instance, but they are statistically associated with one another and maintained by homeostatic mechanisms that resist change.

For example, consider the concept of a biological species. While an essentialist might define a species by a fixed set of genetic markers, the HPC theory recognizes that species can vary in their genetic makeup due to mutations and other factors. However, certain traits tend to cluster together within a species due to natural selection and other evolutionary processes. These clusters of properties, such as morphological features, behavioral patterns, and ecological niches, define the species as a whole, even though individual members may not exhibit all of them.

Similarly, emotions can be understood as homeostatic property clusters. While there may not be a single, essential physiological signature for each emotion, different emotions can be characterized by clusters of properties (e.g., physiological responses, cognitive appraisals, behavioral tendencies) that tend to co-occur due to underlying causal mechanisms. This perspective allows for variability in individual responses while still maintaining the idea of distinct emotional categories.

The HPC theory of natural kinds offers a more robust framework for understanding the observed variability in physiological responses to emotions. It acknowledges that while a single, invariant physiological signature may not exist for each emotion, distinct emotional categories can still be identified based on consistent patterns of underlying causal mechanisms, such as specific brain processes.

Importantly, the HPC theory recognizes that causal mechanisms are not rigid but are influenced by various factors, both internal (e.g., genetic predispositions, personal experiences) and external (e.g., cultural norms, situational contexts). This flexibility allows the theory to account for the observed variability in the physiological and behavioral expression of emotions, explaining why the same emotion might manifest differently across individuals and situations. For instance, fear, while consistently associated with activation of the amygdala, a brain region crucial for threat detection, might manifest as a racing heart in one individual and trembling hands in another, depending on their unique backgrounds. Despite this variability in expression, the core causal mechanism of fear – activation of the amygdala– remains consistent, allowing us to identify fear as a distinct emotional category.

Therefore, understanding emotions as natural kinds through a causal lens provides a framework that avoids the pitfalls of the essentialist view. However, a challenge remains: within the HPC framework, we expect to find some specificity in the causal mechanisms associated with different emotions. Identifying these specific causal mechanisms for each emotion is crucial. If such mechanisms cannot be reliably distinguished, even within the causal framework, the issue of variability re-emerges, raising questions about whether distinct causal patterns for each emotion truly exist or if they also exhibit a high degree of variability.

The causal approach to understanding emotions has also faced challenges. While some studies have shown that each emotion is underpinned by specific brain structures—such as the amygdala for fear and the insula for disgust (Phelps & LeDoux, 2005; Wicker et al., 2003)—other research indicates that brain regions are not exclusive to distinct emotions. For example, the amygdala is activated not only for fear but also for disgust, happiness, and other emotions (Lindquist et al., 2012). This means that a brain region, R, can be activated for multiple emotions (emotion1, emotion2, emotion3, etc.). From this evidence, psychological constructionists such as Barrett (2006a) have drawn the conclusion that there is no specific causal mechanism for different emotions.

The conclusion drawn by psychological constructionists may be too quick. While some studies have shown that there is no one-to-one correspondence between each emotion and specific brain structures, concluding from this that there is no underlying causal mechanism in the brain for each emotion is premature. The absence of a one-to-one relationship does not imply that emotions lack distinct neural underpinnings. Instead, it implies that emotions may be supported by more complex and distributed networks within the brain, where multiple regions interact to generate specific emotional experiences.

When exploring the underlying causal mechanisms of emotions, the expectation of a one-to-one correspondence between specific emotions and individual brain structures, or the notion that each emotion has a dedicated brain region, must be abandoned. Instead, emotions arise from the complex

interplay of multiple brain regions, each contributing its unique signature to the overall emotional experience.

This distributed processing model predicts that emotions are not localized to single brain areas but emerge from the dynamic interaction of interconnected neural networks. Each emotion is characterized by a unique pattern of activation across these networks, with various regions contributing different aspects to the overall emotional experience. For example, the amygdala plays a crucial role in processing fear and anxiety, while the insula is implicated in disgust and visceral sensations. However, these structures are not exclusively dedicated to single emotions and can participate in various emotional states, depending on the specific pattern of activation within the broader network.

Under this conception, it is expected that a given brain region might be activated in various emotions due to its role in different neural networks. For instance, the anterior cingulate cortex (ACC), a region implicated in conflict monitoring and cognitive control, has been found to be activated across a range of emotional experiences, including sadness, anger, and pain (Etkin et al., 2011). Additionally, Lindquist et al. (2012) demonstrated that while specific brain regions like the amygdala and insula are involved in multiple emotions, the unique patterns of interactions among these regions contribute to the distinct experiences of each emotion.

Importantly, these findings only challenge the idea of a specific causal mechanism for each emotion if we define causal mechanisms by specific brain structures alone. However, when we understand the underlying causal mechanism as a network of brain structures or a pattern of activation involving different brain areas, the evidence does not undermine the existence of distinct causal mechanisms for each emotion. Instead, it supports understanding emotions as distinct categories within the framework of HPC theory or causal kinds.

While the precise nature of the causal mechanisms underlying emotions remains an ongoing area of investigation, the evidence suggests that these mechanisms are not confined to single brain structures but rather emerge from complex patterns of activation and interaction within interconnected neural networks. Future research should prioritize mapping these intricate networks and exploring how they contribute to the generation of diverse emotional experiences. Advanced neuroimaging techniques and computational models, in conjunction with physiological, behavioral, and subjective measures, can help elucidate the specific patterns that characterize different emotions.

A final acknowledgment should be made that while Basic Emotion Theory may need to be refined to incorporate insights from Psychological Construction Theory and other research, the core idea of basic emotions as distinct categories with biological underpinnings remains valid. The causal perspective, with its emphasis on understanding the complex mechanisms that give rise to emotions, can contribute to refining BET by moving beyond fixed physiological signatures and embracing the dynamic interplay of neural networks. This approach allows for a more flexible and

nuanced understanding of emotions, accommodating variability while maintaining the integrity of distinct emotional categories.

Conclusion

This paper critically examined the debate between Basic Emotion Theory and Psychological Construction Theory focusing on the universality, discreteness, and biological underpinnings of emotions. The variability in emotional responses, often cited by PCT proponents as a challenge to BET, has been thoroughly analyzed. Despite this variability, I have argued that it does not necessarily undermine the fundamental tenets of BET.

By reframing the concept of emotions as causal kinds, rather than essentialist kinds, I have demonstrated how BET can be reconciled with the observed variability in emotional responses. This causal perspective emphasizes the underlying mechanisms that give rise to emotions, allowing for individual and contextual variations while still recognizing the existence of distinct emotional categories with biological foundations.

The examination of the empirical evidence reveals that while there is some variability in physiological and neural responses, there are also consistent patterns that point to specific causal mechanisms underlying different emotions. This suggests that the observed variability in emotional responses is not a fundamental flaw in BET but rather a reflection of the complex interplay between biological predispositions and the dynamic influence of individual experiences, cognitive appraisals, and cultural norms.

The HPC perspective offers a robust framework for understanding the observed variability in physiological responses to emotions. By focusing on how different brain regions interact to generate emotional experiences, researchers can develop a more nuanced understanding of emotions. This approach moves beyond the limitations of searching for single, isolated brain regions responsible for specific emotions and instead embraces the complexity of the brain's interconnected systems.

While BET may need to be refined to incorporate insights from PCT and other research, the core idea of basic emotions as distinct categories with biological underpinnings remains valid. The causal perspective, supported by the HPC theory, can help refine BET by focusing on the complex causal mechanisms that give rise to emotions, rather than solely on fixed physiological signatures. This approach allows for a more nuanced understanding of emotions, accommodating variability while maintaining distinct emotional categories.

Future research should prioritize mapping the specific patterns of neural activation and interactions that characterize different emotions. Advanced neuroimaging techniques, combined with sophisticated computational models, can help identify the distinct networks and pathways involved in emotional processing. Considering multiple measures, including physiological, behavioral, and subjective reports, is crucial for fully understanding the causal mechanisms underlying emotions. By incorporating these approaches, future research in this direction promises

to significantly advance our understanding of the causal mechanisms underlying emotional responses in diverse contexts.

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