Review Article

Empathy as cultural process: insights from the cultural neuroscience of empathy

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Abstract. *In recent years, explorations of the neural correlates of empathy have been a rapidly growing and exciting area of discovery in social neuroscience. These studies have provided the foundations for understanding the neurobiological processes that allow us to experience and understand the pain and suffering of others. Here we draw upon findings from social and cultural neuroscience to explore how affordances and constraints to social perception and cognition provided by the cultural environments may shape the processes that underlie empathy. Specifically, we examine the dimensions of empathy and their respective neural substrates, and how shared cultural experiences or perceived similarity may facilitate empathic processing at both the subjective and neurobiological levels. Our review also examines emerging research examining the potential role of cultural perceptions of the self and relations with others on the psychological and neural processes of empathy. We conclude by suggesting how insights from a cultural neuroscience of empathy may inform clinical practice.*

INTRODUCTION How do we understand the suffering of others? How can others' suffering be reduced? These questions regarding one of the most fundamental aspects of human social experience have long been explored by philosophers, physicians, and poets. More recently, psychology has provided significant insights and theoretical foundations for understanding the emotional and cognitive processes underlying empathy - the ability to share experience, and react to the affective states of others. With the rapid integration of tools and methodologies from neuroscience and psychology over the past decade, a rich body of knowledge has emerged on the neurobiological basis underlying the human experience of empathy.

In this review, we seek to draw upon the findings from the rapidly growing literature of the neural substrates of empathy, as well as the emerging field of cultural neuroscience, to explore these questions regarding the understanding and reduction of others' suffering. Our perspective proposes that how we understand the suffering of others is largely dependent on our own cultural experiences. First, culture may attune the perceptual, cognitive, and emotional processes involved in empathy and their respective neural correlates to culturally-shaped means of expressing emotions, pain, and suffering, such that individuals who share similar cultural experiences may also readily share each other's suffering. Furthermore, the constraints and affordances our cultural environments provide us during social perception and interaction, and the culturally-constructed meanings associated with social

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relationships may shape how we perceive and interpret to the suffering of others. How we ultimately reduce suffering may largely depend on our ability to appropriately recognize and respond to it - the product of culturally-modulated social perceptual and cognitive processes.

DIMENSIONS OF EMPATHY Though conceptualizations of empathy vary widely, empathy has generally been defined as the ability to subjectively experience and share the feelings of another (Preston & de Waal, 2003). Empathy is not a unitary psychological construct. Rather, it is an integrative process that includes sensorimotor mechanisms that automatically resonate to perceived physical pain, affective mechanisms that allow the perceiver to feel and share the subjective affective experiences of the target, and cognitive processes that allow the perceiver to understand the target's mental and emotional state (Avenanti *et al*, 2010; Decety & Jackson, 2006; Decety & Jackson, 2004; Hein & Singer, 2008). As such, the neural correlates of empathy do not consist of a single neural substrate, and are instead comprised of a network of structures the support pain perception and social cognition.

The neural correlates of empathy that code for the subjective experience of pain have been identified as a network of regions including the anterior cingulate cortex (ACC) and bilateral anterior insula (AI), collectively referred to as the *pain matrix*. Both experiencing pain first-hand and perceiving pain inflicted on a loved one recruit significant reactivity within the ACC and bilateral AI, suggesting the importance of this network in processing the subjective affective experience of pain (Singer *et al*, 2004). A number of social neuroscience studies of empathy have shown reactivity in the pain matrix when participants perceived the pain of others across a variety of contexts, such as facial expressions of pain (Botvinick *et al*, 2005), viewing bodily harm (Jackson *et al*, 2005; Lamm *et al*, 2007), or observing emotional pain (Chiao *et al*, 2009; Mathur *et al*, 2010).

While the neural correlates of affective components of empathy may allow a perceiver to 'feel' what the target is experiencing, the cognitive processes underlying empathy allow the perceiver to understand what the target is feeling and thinking, and the context of the target's pain. Through processes such as mentalizing, perspective-taking, and theory of mind, the perceiver is able to reason and make inferences about the mental and emotional states of the suffering target. These cognitive processes recruited during empathy are represented by activity in a social-cognition network, consisting of the medial prefrontal cortex (MPFC), the temporal parietal junction (TPJ), superior temporal sulcus (STS), and the temporal poles (Hein & Singer, 2008; Vollm *et al*, 2006; Amodio & Frith, 2006; Frith & Frith, 2006; Saxe & Kanwisher, 2003; Decety & Lamm, 2007). By engaging these processes and recruiting the corresponding network of neural structures, one is able to ultimately come to understand another's emotions, desires, intentions, and needs.

In addition to demarcating the affective and cognitive components of empathy for pain, empathy can also be distinguished based on the quality of pain that is being shared between a perceiver and target. Empathy may be elicited for physical pain and bodily harm of another, such as the visceral physical and sensory discomfort that we experience when we observe a child burn his or her hand on a hot stove. But empathy may also be elicited towards the emotional pain and psychological distress of another, such as when we observe the anguish of a child who may have been separated from his or her parents. Though much of the current body of research on the neuroscience of empathy has examined empathy in the context of physical pain, an emerging area of research examining the neural correlates of empathy for emotional pain has revealed that empathy across physical and emotional modalities of pain consists of some shared, as well as some distinct patterns of neural reactivity.

Several studies examining the neural correlates of emotional pain have observed greater activity in the pain matrix as well as regions underlying social cognition during empathy in response to the emotional distress of others. Recent neuroimaging studies have measured neural activity in

participants while they viewed scenes of people expressing emotional pain and distress in the context of a natural disaster. Compared to viewing neutral scenes of people, these emotionally painful scenes elicited greater activity in the pain matrix (ACC and bilateral AI), regions corresponding to the subjective affective experience of pain (Chiao *et al*, 2009; Mathur *et al*, 2010). These studies provide initial evidence that viewing the emotional pain of others produces similar neuronal activity to perceiving physical pain. Another study (Vollm *et al*, 2006) revealed that thinking what would make a person in emotional pain feel better elicited activation in both the anterior and posterior cingulate cortices. Furthermore, the authors also found that both an empathy task and a theory of mind task elicited shared regions of activity in regions supporting the cognitive components of empathy, such as the MPFC, bilateral TPJ, and left temporal pole. Taken together, these studies suggest that empathy for both physical and emotional pain recruit activity within regions in the pain matrix, but emotional pain may also recruit further activity in regions associated with theory of mind and mentalizing. It is possible that while we may be resonating the subjective experience of the target's suffering for both physical and emotional pain, the emotional pain of others may be a more complex state to understand given that the quality of emotional pain may be more context dependent than physical pain, that there may be a lack of a clear eliciting stimulus (i.e. a hot stove), and that mental states may be more qualitatively complex and rich than the visceral sensory experience of physical pain. Thus, the social-cognitive processes supporting empathy may serve an especially important role in empathy for emotional pain, given greater processing may be necessary beyond the resonance of another's subjective experience. Though this hypothesis seems plausible, future research that directly compares the neural correlates of empathy for physical and emotional pain will be essential for clarifying this distinction in empathy.

CULTURAL TUNING OF EMPATHY

Similarity between oneself and another may be an important influence on the level of empathy experienced towards another (Davis, 1994; Batson *et al*, 1995). Though perceived similarity may not be a necessary condition for empathy, it is speculated that perceived similarity between self and other may facilitate the understanding another's plight (Batson *et al*, 2005). In addition to perceived similarities in appearance or group membership, an observer and target may also share common cultural experiences that facilitate the sharing of affective experiences. Acculturation and socialization may influence the neural and psychological processes that support empathy, and these cultural processes may also impact how a person expresses his or her affective and mental states in both verbal and non-verbal manners. For instance, cultures may vary based on patterns of how emotional experiences are appraised and interpreted (Mesquita & Ellsworth, 2001; Masuda *et al*, 2008) and the norms and rules regarding how and when emotion should be expressed (Matsumoto *et al*, 2008; Matsumoto *et al*, 1998). Similarly, the meanings associated with pain and emotional distress, and their modes and idioms of expression also vary by culture (Zborowski, 1969; Kleinman *et al*, 1994; Kirmayer, 1989; Ryder *et al*, 2008). Thus, individuals who share a similar cultural background should be attuned to the quality and intensity of verbal and non-verbal expressions of culturally-similar others, which may provide a basis for facilitated understanding and empathy towards the plight of culturally-similar others. In this section, we present evidence from social and cultural neuroscience that suggests how cultural similarity and shared cultural experiences between perceiver and target may modulate empathic reactivity.

Perceptual recognition of emotions from faces and resonance of these states may vary based on shared cultural norms and styles of emotion expression between perceiver and target. Though facial expressions of emotion are largely universal, there may be subtle cultural variations in expression of facial emotions. Ultimately, these stylistic dialects of emotion expression may allow a perceiver to more effectively decode emotions and affective signals from the non-verbal expressions of culturally-similar targets relative to targets from an environment that stresses different dialects and norms of emotion

expression. Elfenbein & Ambady (2002) provide support for this theory through a meta-analysis spanning multiple cultures that found that individuals are better at recognizing the emotions of others from the same culture than another culture. This work was extended to the neurobiological level by Chiao and colleagues (2008), who discovered that the amygdala, a structure that processes fear and fear-relevant stimuli, reacted more strongly when viewing fearful faces of members from the same cultural group as the perceiver relative to other cultural groups. Given that processing and resonating a related other's fear has high adaptive value for motivating avoidance of potential threats, neural reactivity to the expressions of fear of others may be selectively tuned by culture. In the pain domain, viewing painful facial expressions of others is sufficient to elicit activation within the pain matrix of the observer (Botvinick *et al*, 2005). Cultural specificity of reactivity in pain regions to facial expressions of pain in the absence of other contextual cues has not yet been tested. To the extent that patterns and styles of facial expressions of pain vary subtly across cultural contexts as emotions do, we should observe similar tuning of the pain matrix to culturally-consistent expressions of pain given the potential adaptive value of resonating a culturally-similar other's distress for reducing potential harm to oneself, social coordination within cooperative groups, and increasing genetic fitness through kin selection (Hamilton, 1964; Wilson, 1988; de Waal, 2008).

Recent neuroimaging evidence suggests that there may also be a cultural attunement of the cognitive processes underlying empathy, such as inferring the mental states of another in pain. In a study by Adams and colleagues (2010), American and Japanese participants attempted to infer the mental and emotional states of American and Japanese targets through the Reading the Minds in the Eyes Task, a measure of mental state reasoning from subtle expressions conveyed by the eyes. The authors found that participants were not only more accurate when inferring mental states from the eyes of culturally-similar others, but they also exhibited greater activity in the bilateral superior temporal sulcus, a region involved in mentalizing and reasoning about the mental states of others, when reading the eyes of similar-culture others. This cultural attunement of mental and emotional state inference seems to extend to the social context of empathy. When native Korean and Caucasian-American participants viewed scenes of Korean and Caucasian-American targets expressing emotional pain and distress, participants of both cultures exhibited greater activity in the MPFC and bilateral temporal-parietal junction, regions associated with mentalizing and theory of mind processing, when viewing the pain of ingroup relative to outgroup members (Cheon *et al*, 2009).

Emerging research on the neural correlates of empathy in intergroup contexts has demonstrated that perceived racial similarities between oneself and a target receiving a painful stimulus may also evoke selective reactivity in the neural structures supporting empathy. In a neuroimaging study comparing Chinese and Caucasian participants, Xu, Zuo, Wang, & Han (2009) demonstrated that viewing a needle pricking the neutral face of an ingroup member elicited greater reactivity in the ACC and AI relative to viewing the same stimulus applied to a neutral outgroup member's face. Avenanti, Sirigu, & Aglioti (2010) utilized transcranial magnetic stimulation (TMS) to examine how similar perceptions of a painful stimulus applied to the hands of Caucasian or African individuals may influence the degree of sensorimotor simulation among Caucasian and African perceivers. While TMS was applied to a section of the scalp over the motor cortex to induce motor-evoked potentials to the first dorsal interosseus muscle of the hand, participants observed a needle pricking the same muscle within same-race or different-race hands. The results revealed greater inhibition of participants' corticospinal system, reflecting subjective experience of pain, when participants viewed ingroup hands relative to outgroup hands. Moreover, this difference in empathic reactivity between ingroup and outgroup hands was correlated with greater levels of implicit racial biases favoring one's ingroup. Finally, another recent neuroimaging study showed that for African-American and Caucasian participants, empathy for ingroup members was neurally distinct from empathy for humankind, more generally (Mathur *et al*, 2010). When observing the emotional suffering of others, African-American

and Caucasian participants recruited ACC and bilateral AI, yet African-American participants additionally recruited MPFC when observing the suffering of members of their own racial group. Moreover, neural activity within MPFC in response to pain expressed by ingroup relative to outgroup members predicted greater empathy and altruistic motivation for one's ingroup, suggesting that neurocognitive processes associated with identification with others underlie extraordinary empathy and altruistic motivation for members of one's own racial group.

Together, these studies provide converging evidence using different methodologies of neuroscience that suggests that perceived similarity between oneself and a target facilitates the resonance and simulation of the target's pain. Moreover, shared cultural means for expressing and interpreting social expressions of pain may provide a further foundation for similarity with a target, shaping how accurately and effectively we interpret, and ultimately experience, the suffering of others.

CULTURAL MODULATION OF EMPATHY

Though shared culture or group membership with a target may facilitate empathic processing, culture may directly modulate how we empathize with the pain of others. The cultural environment may shape social structures, meanings, beliefs, and practices, providing culture-specific constraints or opportunities in the development of psychological processes and behaviors pertaining to social perception and interaction. Moreover, as one becomes acculturated to these processes through learning and socialization, the corresponding neurobiological architecture may also be shaped by these cultural affordances and constraints (Chiao & Ambady, 2007). Indeed, the emerging field of cultural neuroscience has demonstrated that culture may serve as a powerful influence that not only shapes perceptual, cognitive, and emotional processes, but also their respective neural underpinnings (Ambady & Bharucha, 2009; Chiao, 2009; Han & Northoff, 2008; Park & Gutchess, 2006). Culture may dynamically influence the neural and psychological processes that allow us to understand and react to the suffering of another to the extent that different cultural environments provide different modes of perceiving and processing the experiences of others. In this section, we outline how the neurobiology of empathy may be dynamically influenced by culture.

Cultural psychology has revealed one critical influence of culture on psychological functioning is through shaping whether individuals conceptualize the self as being relatively interdependent or independent with social others (Markus & Kitayama, 1991; Triandis, 1989; Oyserman *et al*, 2002). Typically collectivistic cultures, such as East-Asian societies, may promote an interdependent view of the self by promoting social meanings, values and norms that emphasize the self as being a relationally interconnected entity and stressing the importance of attending, adjusting, and being attuned to the needs and experiences of others. On the other hand, typically individualistic cultures, such as Western European and North American societies, may promote an independent view of the self by emphasizing the self as being a unique and independent entity, and stressing the merits of self-expression and the pursuit of one's own aspirations.

An implication of these cultural variations in self-construal styles is culturally-varying pressures and expectations for individuals to readily engage in and attend to the internal states (e.g., perspectives, emotions, beliefs, desires) of others relative to the internal states of the self during social interactions. Due to the relatively greater emphasis on adapting to the needs of others within collectivistic relative to individualistic cultural contexts, members of collectivistic cultures may more readily engage in cognitive processes underlying empathy, such as mentalizing, theory of mind, and perspective-taking to navigate social interactions. In support of this notion, behavioral studies in cultural psychology have revealed that people from collectivistic East-Asian cultures may adopt others' perspectives and infer other's knowledge during socially-relevant situations more spontaneously than members of individualistic Western cultures. For instance, when remembering social events with the self as the center of attention, Asian participants were more likely to remember these situations from a third-

person perspective (i.e. through the eyes of others who were present) than through a first-person perspective (i.e. as they actually perceived or experienced the situation) (Cohen & Gunz, 2002). Another study comparing the performance of Chinese and American subjects on a cooperative task that required taking the perspective of one's partner revealed that Chinese participants spontaneously adopted the perspectives of their partner, whereas American participants less readily adopted their partner's perspectives and made substantially more errors throughout the task (Wu & Keysar, 2007). These findings suggest that members of cultures that stress interdependence between self and other, and promote 'other-orientedness' during social interactions, may be more reflexively attuned to the perspectives and mental states of others. As a result, empathy may be engaged as a relatively more automatic process for members of collectivistic over individualistic cultures.

This theory was tested in a recent neuroimaging study on the influence of culture on how readily neural processes underlying empathy may be engaged. Cheon and colleagues (2009) had native Korean and Caucasian-American participants passively view images of Koreans and Caucasian-Americans in scenes of emotional distress during fMRI. Participants passively viewed each image and were not provided explicit instructions to report the empathy towards the targets. Participants also completed the Self-Construal Scale (Singelis, 1994). A whole brain regression using dimensions of the self-construal reflecting one's attunement to experiences and outcomes of the self relative to others (primacy of self and relational interdependence dimensions) (see Hardin *et al*, 2004) revealed that as participants endorsed greater "other-focusedness" on these scales, they recruited greater activity within the ACC and right AI. Furthermore, this effect was largely driven by the Korean participants, who exhibited activity in the pain matrix (ACC and bilateral AI) and the MPFC when viewing the emotional pain of others, while the Caucasians-Americans did not recruit significant levels of activity in empathy-related regions as a function of "other-focusedness." This finding provides initial support to the notion that aspects of interdependent self-construal style may play a greater role in collectivistic cultural contexts relative to independent ones in determining how readily or spontaneously a person may engage in or focus on the internal experiences of others- ultimately shaping empathic reactivity.

Another cultural dimension that may modulate the psychological and neurobiological processes of empathy is culturally-shared beliefs and practices regarding social hierarchies. Though inequality is universal, an important way that cultures differ is in how they react towards inequalities, such that cultures may vary in the extent to which they value and accept norms and practices that maintain social hierarchies, as well as the meanings attributed to social hierarchies and power (Hofstede, 1980; Freeman *et al*, 2009; Zhong *et al*, 2006). At a cross-national level, attitudes towards inequality and social hierarchy may be reflected by a culture's level of power distance (Hofstede, 1980; 1983). While some societies, such as the United States and Germany, exhibit relatively lower levels of power distance and greater preferences for equality, other societies, such as China and the Philippines, may exhibit relatively higher levels of power distance and greater tolerance for inequalities. At an individual level, preference for status-based social hierarchies over egalitarianism is represented by Social Dominance Orientation (SDO; Pratto *et al*, 1994; Pratto *et al*, 2006). Notably, SDO may modulate empathy, in that higher levels of SDO are associated with lower communality and empathic concern for the welfare of others (Pratto *et al*, 1994).

To test whether SDO may modulate empathic reactivity at the neural level, Chiao and colleagues (2009) conducted a neuroimaging study in which participants viewed images of people in situations of emotional pain. SDO was also measured following scanning. The authors found that SDO modulated reactivity in the pain matrix while participants viewed the painful relative to neutral situations. Specifically, individuals higher in hierarchy preferences exhibited greater attenuation of reactivity in the ACC and left AI, suggesting that beliefs about social hierarchies may influence the subjective affective experience of another's pain. To the extent that cultures vary in beliefs and meanings they ascribe to social hierarchies, neural reactivity in regions coding for empathy may also vary in reactivity as a function of culture. It is important to note that this is not a suggestion that some members of some

cultures are inherently less empathetic or altruistic than others. Rather, attitudes and preferences regarding hierarchical relationships may be a stronger determinant of empathic processes in some cultures than others.

Together, these initial studies of the role of culture on empathic processes reveal that how we come to understand the suffering of others may largely be dependent on our own cultural experiences. Specifically, how we navigate our cultural environments and subsequently come to perceive our relationships with social others play a significant role in how we react to the pain of others psychologically and neurobiologically. Though explorations of the cultural neuroscience of empathy are in nascent stages, these early studies provide promising clues of the important role culture may play in empathic processes.

THE CULTURAL NEUROSCIENCE OF EMPATHY: LINKS TO CLINICAL CARE

From the exploration of the role of culture on empathic processes thus, we conclude that a key component to reducing the suffering of others includes being able to effectively recognize and interpret the experience, emotions, and mental states of another's pain and suffering - a process that may be mediated by both the cultural background of the observer and target. Here we examine how this interplay between culture and empathy may influence outcomes within the clinical setting, a context in which sensitivity and understanding of another's pain is critical for the reduction of suffering.

Given that clinicians routinely rely on subjective self-reports of pain, sensitivity and understanding of patient pain by clinicians is a critical first step in the treatment of pain, both physical and psychological. But when clinicians and patients do not share the same cultural background or when perceived similarities may be low, empathic processing may reduced. Furthermore, individuals have little awareness of how their cultural environments may influence their social perception and behavior (Kitayama, 2002). As such, in these situations physicians may be susceptible to biases in their empathic processing other another's suffering. For instance, based on the findings of Xu *et al* (2009) and Avenanti *et al* (2010) lower empathic resonance may be elicited for patients that may be dissimilar to the clinician in ethnicity or culture, which may lead to underestimation of the actual pain experienced by the patient. Indeed, a number of studies have suggested that the socio-demographic background of the patient may lead to unequal treatment for pain-related conditions (Freeman & Payne, 2000; van Ryn & Burke, 2000). Moreover, clinicians' sensitivity to patient pain may further be diminished by the influence of stereotypic beliefs about the patient that may occur outside of the clinician's awareness (Avenanti *et al*, 2010).

The cultural tuning of empathy towards culturally-consistent expressions of pain may also shape the clinician-patient interface. Shared culture between clinicians and patients may provide clinicians greater specificity in interpreting and decoding the non-verbal expressions of patients' emotional and mental states, which may be reflected by cultural specificity in regions associated with emotional and mental state processing (Chiao *et al*, 2008; Adams *et al*, 2010; Cheon *et al*, 2009). This process may be further complicated when cultural discrepancies are present in the idioms and expressions of distress familiar to the patient and practitioner. For instance, sharing a common language can influence correspondence in perceptions of pain between physician and patient (Harrison *et al*, 1996). Culture may influence the extent to which people somatize or psychologize emotional or psychological experiences (Ryder *et al*, 2008; Kirmayer, 1989; Tsai *et al*, 2004), which may exacerbate the challenge of empathizing with and understanding the emotional suffering of a patient who does not share the same cultural expressions of suffering as the clinician.

But, the presence of potential biasing influences from the cultural environment or limited cultural attunement of empathic processes should not serve as a determinant of suboptimal clinical outcomes.

Empathy and understanding of another's suffering and plight is a dynamic, learnable, and developable process, even for targets that are markedly dissimilar from the self (Marangoni *et al*, 1995; Batson *et al*, 1997). In clinical contexts, it has been suggested that emotional engagement and attunement with patients may produce improved therapeutic outcomes, such as greater patient-clinician trust, greater patient engagement in treatment, and reducing patient-clinician conflicts (Halpern, 2003; Suchman *et al*, 1997; Kim *et al*, 2004; Halpern, 2007). Halpern (2007) suggests that empathy may be particularly important in situations of patient-clinician conflicts, and positive therapeutic outcomes may be maintained through cultivating empathy towards the patient's emotions. A key component in this process is suggested to be maintained curiosity of the patient's experiences, which may engage processes to understand the patient's perspectives and concerns (Halpern, 2007; Davis & Kraus, 1997). Similarly, studies of the role of empathy in intergroup relations have suggested that empathy and interpretation of the emotions of others play a critical role in improving attitudes, eliciting perceptions of similarity, and ultimately motivating concerned helping behavior (Batson *et al*, 1997; Stephan & Finlay, 1999; Cuddy *et al*, 2006). Though cultural experiences may provide the basis for facilitating sensitivity towards the pain of culturally-similar others, empathic processes such as emotional engagement, curiosity, and perspective-taking may be powerful tools for clinicians to bridge the cultural divide with their patients.

CONCLUSION Despite the fundamental role suffering plays in the human experience, the interpretation of and response to suffering itself is a culturally-shaped phenomenon. As such, psychological and neural processes dedicated to understanding one's own suffering and the suffering of others are also contingent upon cultural systems, such as appraisal, expression, language, and meanings involved in the experience of suffering. Consequently, any scientific endeavor to understand the psychological and neural processes that allow us to empathize with the pain and suffering of others will be incomplete without an exploration of the critical role of culture on our minds and brains.

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