Primer on Literature Supporting Empathy for Enhancing Pedagogy:

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Definitions

Loosely speaking, empathy is the experience one has when sharing another person's emotional state. A specific consensus definition of empathy can be summarized as a cognitive-emotional state experienced by an observer following the recognition and internal replay of another agent's subjective experience. The replay of an emotion into the ongoing conscious experience of the observer may induce prosocial behavior to provide aid or support for the agent. Note that an agent is identified as an 'actor' capable of self-derived decisions and internal cognitive-emotional experiences.

Neurocognitive Aspects: Recognition & Replay

Recognition involves matching perceived behavior to an internal representational model of potential behavioral and cognitive states that can be experienced by independent actors. Recognition is also termed as mentalizing, perspective taking or theory of mind in the literature.

Replay instantiates the matched cognitive state into the current stream of conscious experience. Replay is termed as experience sharing, emotional contagion, shared self-other representations, shared self-other representations in the literature.

The cognitive and emotional components of recognition and replay are computed as separate representations and physically instantiated in distinct neural circuits (see neurophysiology section). The neural circuits underlying the experience of empathy are subject to developmental changes and do not approach maturity until young adulthood. It is unknown whether empathy remains plastic through adulthood.

Utilitarian Application of Empathy

Overall, there is a wide body of literature claiming that teaching with empathy can improve outcomes in educational achievement - specifically in special populations or occupations that require empathetic skills (i.e. social or medical workers, counselors, therapists). Techniques for targeting empathy both focus on the cognitive and emotional aspects. The most successful techniques will target both.

However, a major caveat is that emotional states can be very difficult to consistently activate and require a steady context, both on the part of the educator and student, in order to facilitate empathetic learning. Furthermore, the educator or practitioneer will need to measure traits related to change with empathetic experience in order to determine further instruction techniques. So, not only does the context need to be controlled, but the practioneer will need validated tools that can track the individual progress of individuals.

From a neuroscientific perspective, the most promising avenues along these lines will include a synthesis of neuroimaging, behavioral instruments, role-playing/immersion and virtual reality. Some of these areas are more developed than others but progress is being rapidly achieved. This is a perfect time to jump into this field and synthesize these various disciplines for improving pedagogical techniques.

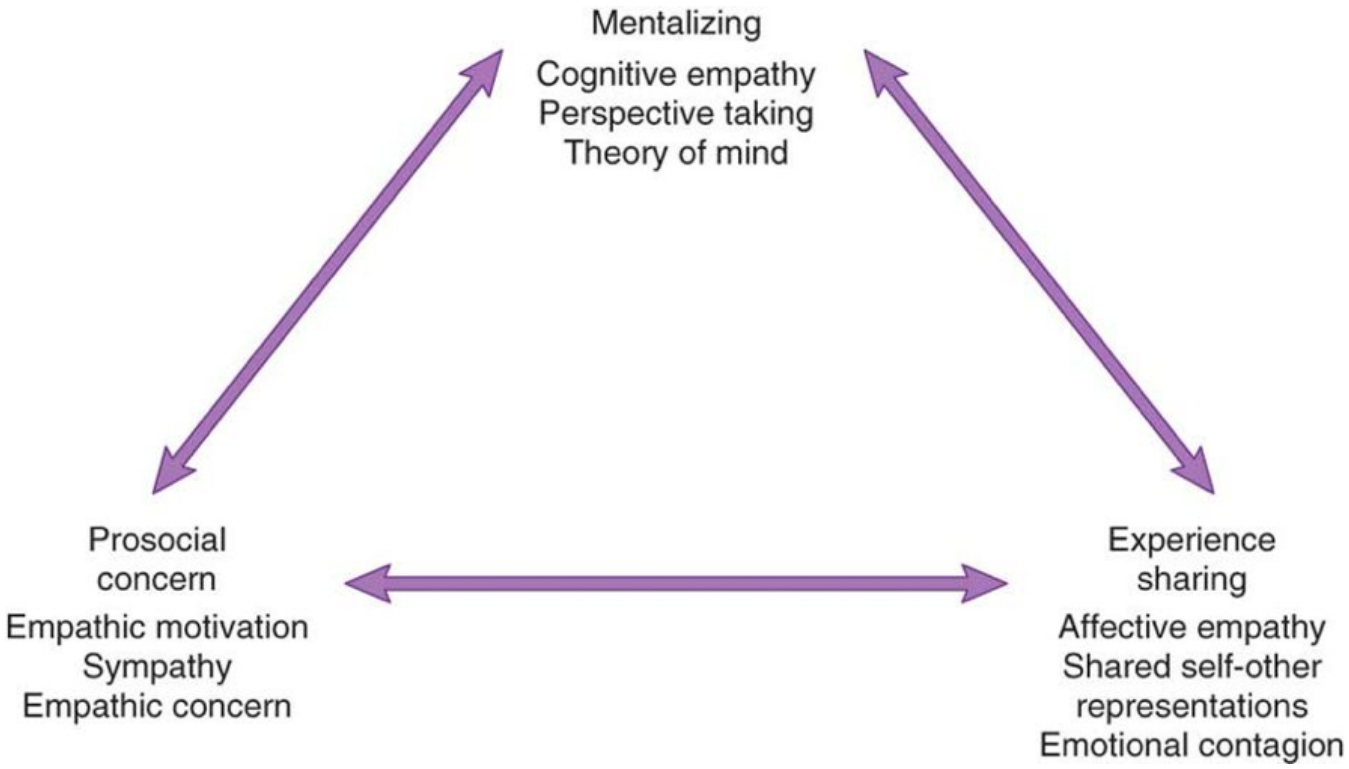
Continue below to see:

Brief Timeline of Definitions

- Empathy as a multi-stage interpersonal process. (Reik 1948, Rogers 1975)
- Empathy as a cognitive, affective and/or motivational dispositional trait. Empathic responses to those in distress provides a motivation for altruistic behavior. (Hoffman 1982, 83)
- Knowing (cognitive), feeling (affective), responding to another's distress comprises distinct stages of the empathetic response. (reviewed by Levenson and Ruef 1992)

- Empathetic accuracy, ability to detect emotional information transmitted by another. (Levenson and Ruef 1992)
- Empathy as a situation-specific cognitive-affective state. (Duan and Hill 1996)
- Empathy enables several cognitive skills (Decety & Moriguchi 2007):

1. Affective Sharing: subjective reflection of another person's observable experience. Facilitated by automatic neural mirroring and the shared representations such as facial expressions or activities associated with feeling
2. Self-awareness: clear differentiation between own and observed experience.
3. Mental flexibility & perspective taking
4. Emotion regulation



Zaki & Oshner 2012

Developmental Aspects

- Empathy is a cognitive-emotional state first acquired early in childhood and and elaborated throughout adulthood as the developing observer experiences and learns to recognize a greater range of emotional states. (Decety 2010)
- “For children, empathy mediates social understanding, emotional competence, prosocial and moral behavior, compassion and caring and regulation of aggression and other antisocial behaviors.” (Singer, T., & Lamm, C. 2009)
- Empathy can be decomposed into cognitive and affective processes that are age and context dependent. Sophistication of empathetic processing is related to ability to distinguish affective states in other agents. Mature cognitive empathetic abilities enable experiential emotional states relating to the perspective of another individual. (Feshbach Model, 1975, 78)

Neurophysiology

- A distributed parallel processing model of empathy in the brain has been proposed to explain three major functional components for the experience of empathy. 1) affective sharing 2) self-other awareness and 3) mental flexibility (Decety & Jackson 2004)
- The mirror neuron system is considered to harbor representations of theory of mind in other agents.
- Mirror neurons were discovered by Italians eating lunch in front of primates. Recordings showed neurons activated only when experimenters would perform eating behaviors. This was reflected by imitation in the primates. (Iacoboni 2008)
- Empathy can be characterized as the interaction of physically observable neural networks that include automatic and affective processing and controlled cognitive processing, distinct but interrelated, that may be instantiated differently in the brain. The limbic regions (dorsal Anterior Cingulate Cortex, Anterior Insula, Ventromedial Prefrontal Cortex) are involved in processing affective congruence (recognition and instantiation of another agent’s emotional state). The mirror and mentalizing systems provide a distinct pathway for sharing an experience with another. The septal regions provide a motivation signal for prosocial behavior. (Morelli, Rameson & Lieberman 2009)

- Cognitive load may diminish the capacity for empathy by occupying social decision making circuits required for recognition of another agent's internal state. (Morelli & Lieberman 2013)

Neuroimaging Meta Analysis

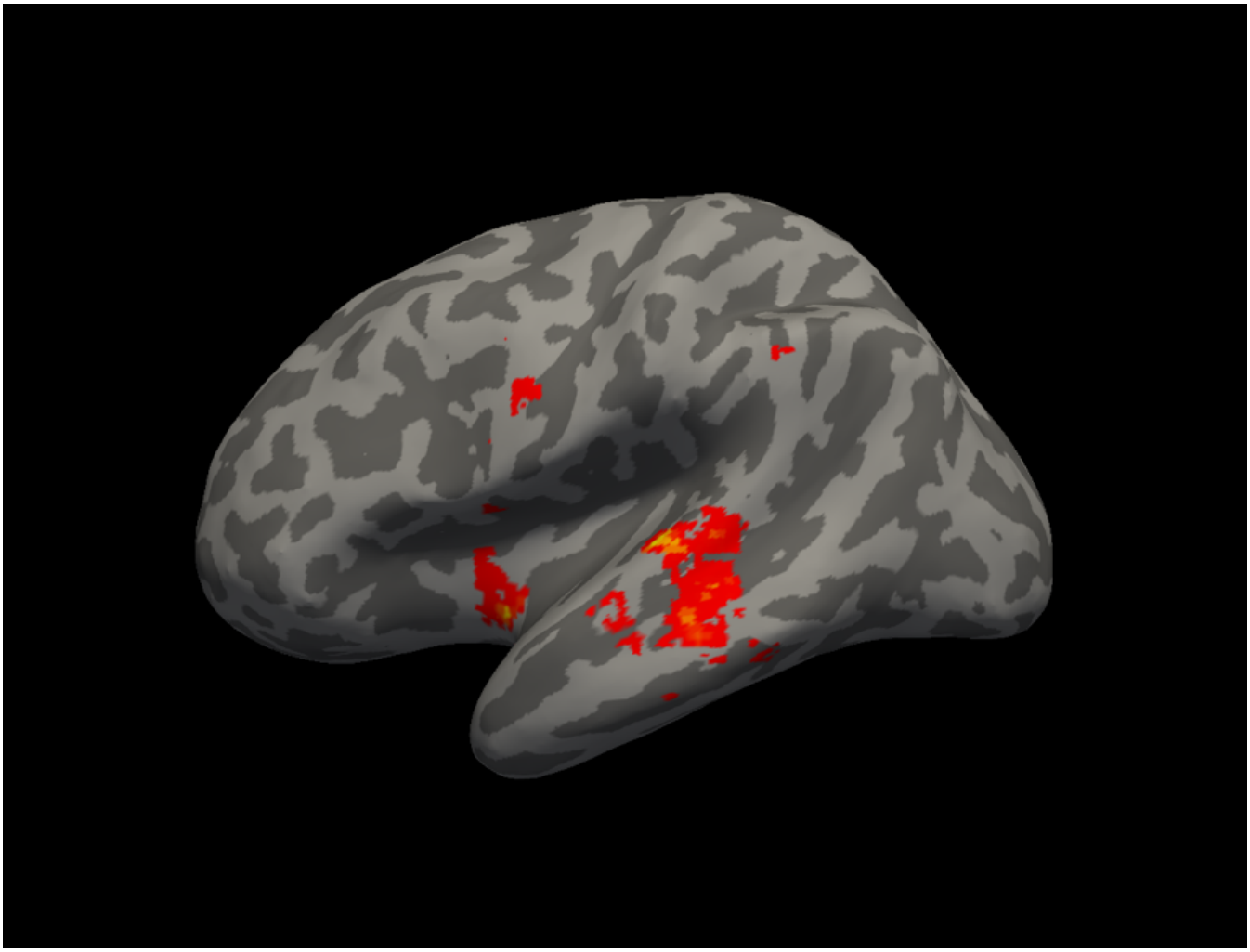
Activation coordinates reported in 187 studies (http://neurosynth.org/analyses/terms/empathy/) on empathy were synthesized and corrected for multiple comparisons on a standard brain template using the neurosynth neuroimaging meta-analysis software.

The overlap across studies revealed the following neural networks involved in empathy

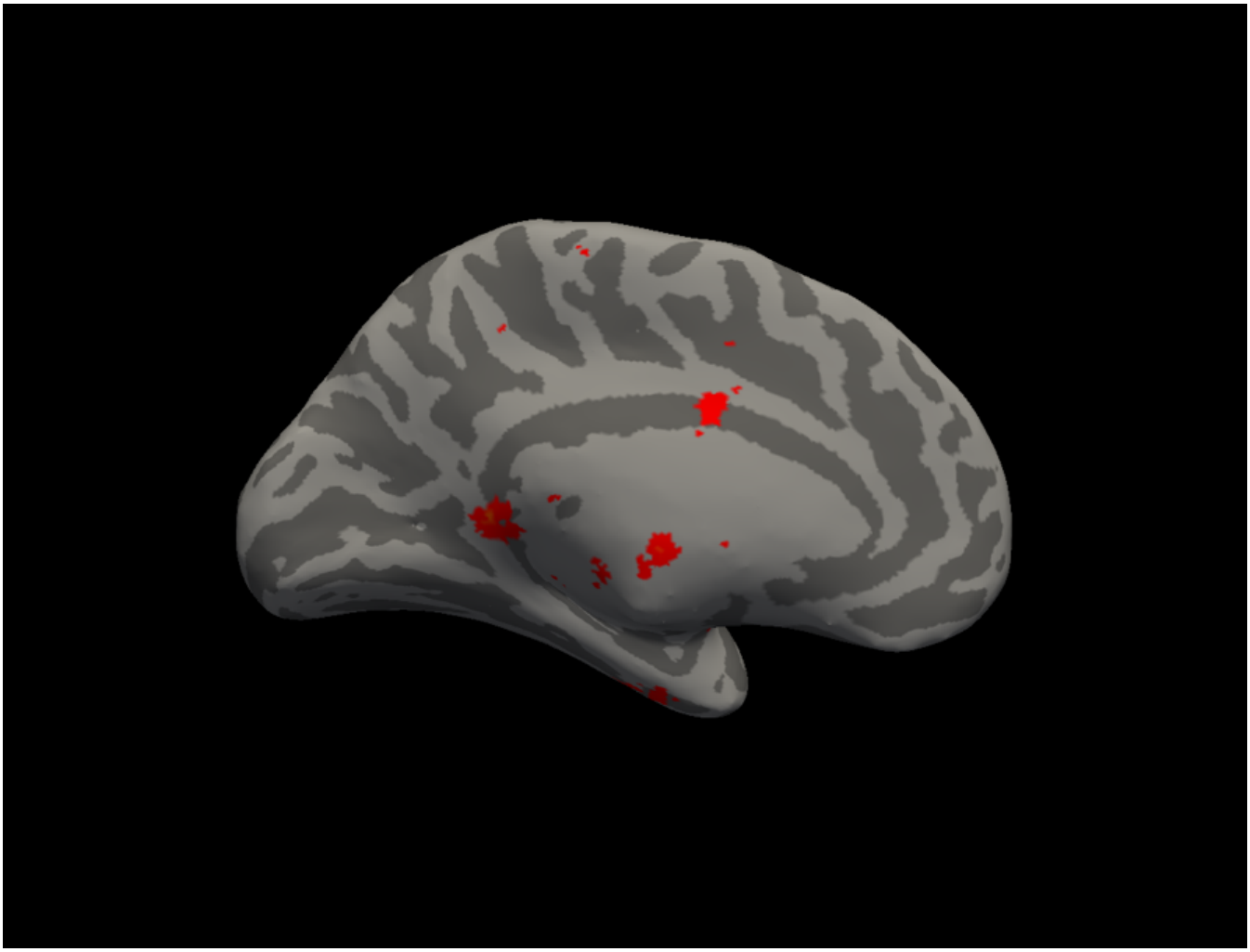
- Orbitofrontal Cortex
- Ventromedial and ventrolateral Prefrontal Cortex
- Cingulate Cortex (Anterior and Posterior divisions)
- Inferior Frontal Gyrus
- Anterior Temporal Pole
- Premotor Cortex
- Angular/Supramarginal Gyrus
- Anterior Insula
- Posterior Insula
- Vermis of the Cerebellum
- Periaquaductal gray
- Amygdala
- Thalamus

Brain areas with high statistical occurrence across the 187 studies were projected on an inflated cortical surface to facilitate viewing. Note subcortical areas such as the amygdala and thalamus and cerebellum are not included in these depictions.

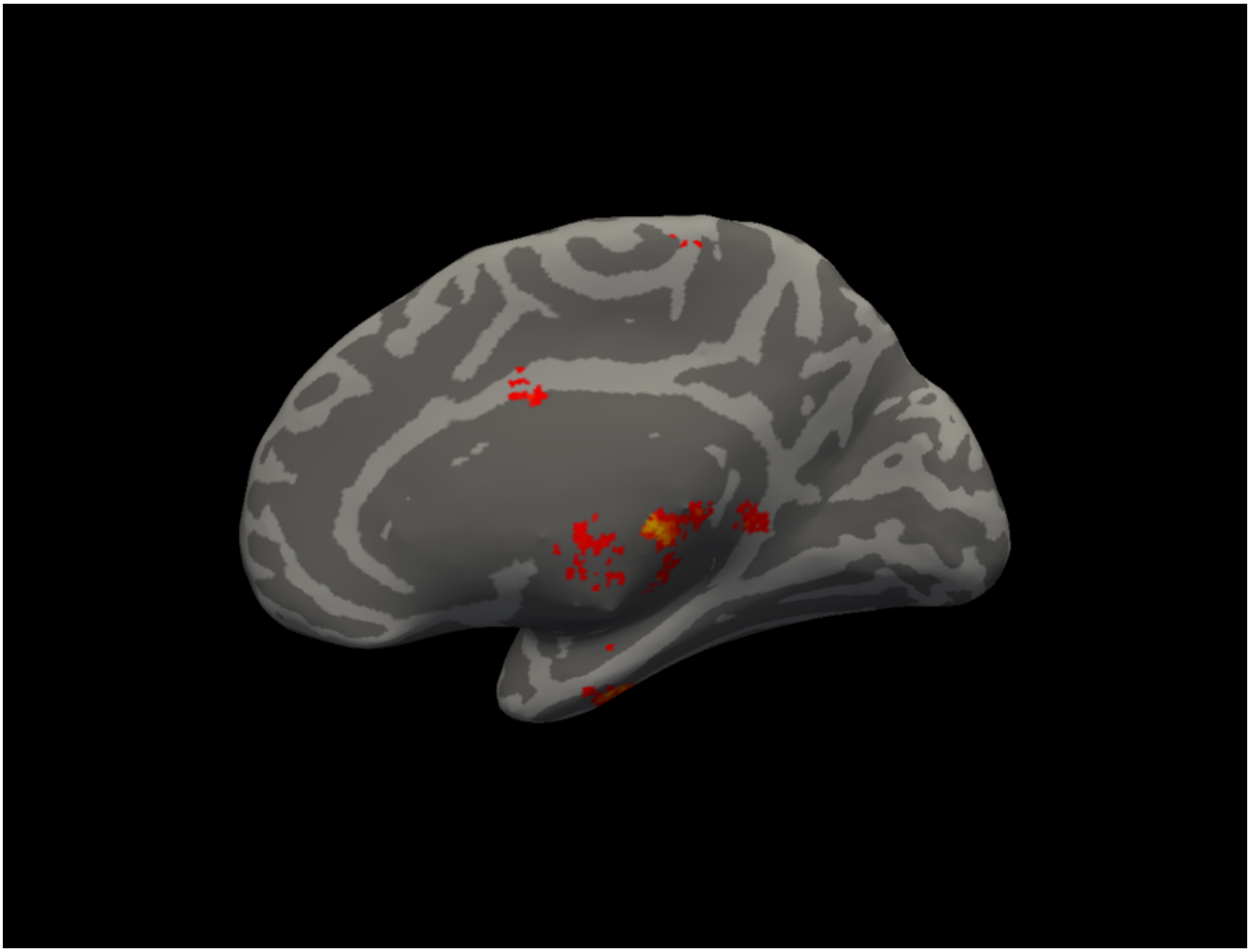
Left Hemisphere Lateral View



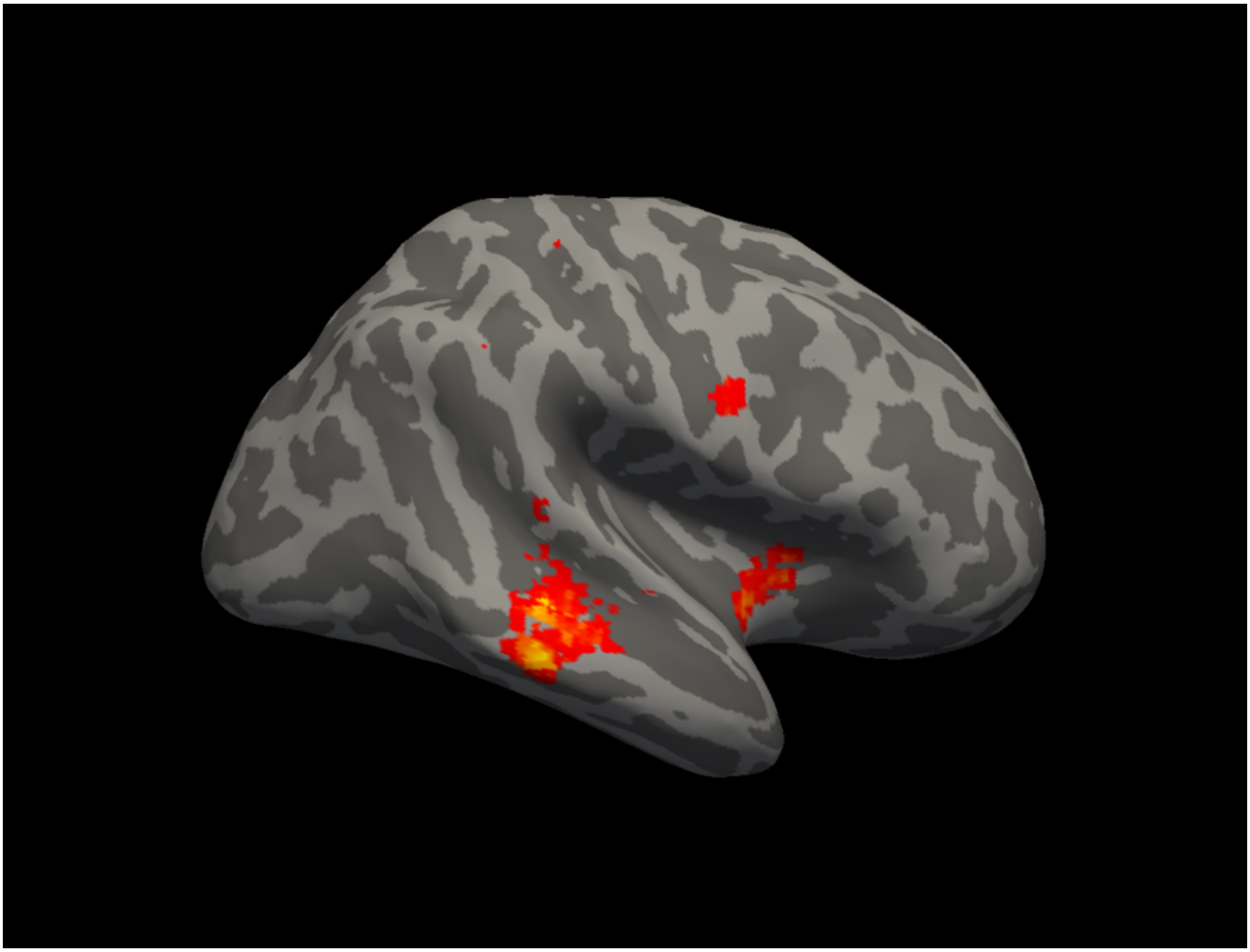
Left Hemisphere Medial View



Right Hemisphere Medial View



Right Hemisphere Lateral View



Applications of Empathy to Pedagogy

Main take-aways: Target the cognitive component of empathetic processing! Expand abilities to process high cognitive load under emotional conditions to promote empathetic responses. Exposure to a wide variety of emotional contexts enriches the internal library used to recognize and replay emotions perceived in other agents. Simply, let students engage in other realities beyond their own to build a rich emotional lexicon with which they can use to recognize, internally simulate and (prosocially) act upon perceived emotional states in the world. Key to any intervention or pedagogical technique are tools for measuring empathy.

Pedagogical Techniques

Some techniques for promoting empathetic skills include role playing, gestalt techniques, psychodrama, imitative play (Calley & Gerber 2008, Chung et al., 2002, Pearson et al., 2007). These techniques are thought to act on the mirror neuron system

by activating neural representations commensurate with the current context. Psychodramas have been suggested to simulate complex emotional situations and can help students appreciate the emotional state of the role they are placed in (Moreno 1999).

The developmental nature of the mirror neuron system and the subsequent emergence of mature empathatic skills may also limit the effectiveness of some interventions/pedagogical applications to specific age ranges.

- Self awareness and mindfulness applied to expanding emotional intelligence and empathetic ability is thought to be a potential boon for training social work practitioners and researchers. A detailed schematic of applying empathy for social work appears in Gerdes et al., 2011 and summarized in the table below.

TABLE 2. Social Work Framework for Empathy

Component	Definition	Key Aspects	Ways to Develop
Affective response	Involuntary physiological reaction to another's emotions and actions	Mirroring[a] Mimicry[b] Conditioning[c]	Promote healthy neurological pathways
Cognitive processing	Voluntary mental thought processes used to interpret one's affective response; enables one to take the other person's perspective	Self/other-awareness[c] Mental flexibility[d,e] Role-taking[c] Emotion regulation[d] Labeling[c] Judgment[c] Perspective-taking[d,e] Self-agency[e]	Set boundaries Practice mindfulness Use role-plays
Conscious decision making	Voluntary choices for action made in response to cognitive processing	Empathic action[f] Social empathy[g] Morality[b] Altruism[h]	Helping Advocacy Organizing Social action

[a]Iacoboni (2008); Kaplan & Iacoboni (2006); Gallese & Goldman (1998); Rizzolatti & Craighero (2004)
[b]Hoffman (2000)
[c]Davis (1996)
[d]Decety & Moriguchi (2007)
[e]Decety & Jackson (2004)
[f]Gerdes & Segal (2009)
[g]Segal (2006, 2007a, 2007b, 2008)
[h]Batson (1991); Batson et al. (1991, 2003)

See the Gerdes Paper for Many More Examples of Applying Empathy to Teaching

- Teacher empathy: The teacher as a therapist and the student as the client (Carkhuff & Berenson 1967)
- Mindfulness can be used as a tool for decreasing negative affect, honing focus and increasing self-awareness (Arch & Craske 2006, Baer & Krietemyer 2006, Linehan 2018, Brown & Ryan 2003, Levitt et al., 2004, Block et al., 2007, Giluk 2009)
- Video games and simulations can be useful immersion practices to engage empathetic processing (Schrier 2016).

- In Shin 2018, story telling using a VR headset provided an immersive environment that facilitated intentional decision making and provides a quantitative controlled context for measuring and testing empathetic responses.
- Cheng et al. (2010) applied 3D animated scenarios to promote empathy in special needs clasroom of children diagnosed with autism.
- Wengenroth et al., 2010 applied VR to teach secondary school students with allergies to experience various occupations.
- Game theoretic approaches may also be used to increase or measure empathetic understanding (Barak et al., 1987, Batson 1999).

Tools for Measuring Empathy

Early work by Davis (1983) suggests a multidimensional approach by synthesizing across standardized instruments of psychological disposition to hone in on the different aspects of empathetic processing.

The empathy quotient (EQ), a self-described analogue to IQ has been proposed and partially validated (Lawrence 2004).

The Empathy Assessment Index established by Gerdes et al. (2011) takes root in social work practice and draws inferential power from instruments rooted in cognitive neuroscience (see also Lietz et al., 2011).

Game theoretic approaches also provide many ‘games’ or constructed social scenarios intended to mathematically decompose decision making and quantify various social traits such as selfishness, empathy, altruist, etc (Singer & Fehr 2005, Edele et al., 2013).

Shady’s take: In the future, we will see EEG/fNIRS/fMRI brain-based measurements of empathy in combination with VR tech. (Suzuki et al., 2015, Christov-Moore et al., 2019)

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