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Dissociating the ability and propensity for empathy

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Abstract

Neuroimaging suggests psychopaths have reduced vicarious activations when simply witnessing pain but less so when asked to empathize. This inspired us to distinguish an *ability* from a *propensity* to empathize. We argue that (a) this ability-propensity distinction is critical to characterize empathy in psychiatric disorders such as psychopathy and autism, (b) that costly helping might be best predicted by the *propensity* for empathy and (c) suggest how social neuroscientists can start exploring this distinction.

Many researchers agree that empathy is something like ‘feeling what we would feel in another’s stead’. Instruments designed to measure empathy acknowledge multiple facets to empathy (e.g. cognitive vs. emotional empathy [1]; fantasising vs. perspective taking vs. personal distress vs. empathic concern [2]; actions, emotions and sensations [3]; Box 1), however, individuals are characterized on each of these facets using a single variable on a high-low continuum. Inspired by a study on psychopathy [4], here we argue, instead, to dissociate two variables – an ability and a propensity – for each facet of empathy (Box 2). We will discuss how this impacts on the science of helping behavior and social neuroscience.

Need for a Ability-Propensity Dissociation in Psychiatry

A hallmark characteristic of adults with psychopathy (PCL-R) and youths with conduct disorders of the ‘limited prosocial’ subtype (DSM-V) is reduced empathy. But are they unable to empathize, or simply less likely to empathize in certain situations?

Psychopathic offenders [4] were scanned while viewing people experiencing pain. They were first told to watch the movies carefully, then to deliberately feel what the people in the movies felt. Psychopaths showed reduced vicarious activations (Box 1) under instructions to simply observe, but these differences largely disappeared under instructions to empathize [4]. Two groups can thus have a similar ability for vicarious activations as revealed by situations encouraging empathy (“try to feel with the victim”) but a different propensity to

engage this ability spontaneously in situations not encouraging empathy (“just watch the movies”).

Psychopathic criminals can be charming and attuned while seducing a victim, thereby suggesting empathy, and later callous while raping a victim, thereby suggesting impaired empathy. If vicarious activations underpin empathy, the ability-propensity distinction derived from vicarious activations would translate to empathy, and allow for this complexity: any person with a high ability but reduced propensity for empathy could choose to use his ability for seduction but not for raping, as empathy would facilitate the former but hinder the latter. To accurately characterize empathy in psychiatric groups, it may thus be necessary to measure empathy in multiple representative situations to assess their ability and determine where along the propensity curve their empathy might be abnormal, and where, preserved (Figure I, Box 2).

This ability-propensity distinction may also shed light on autism[5]. Facial mimicry is abnormal when autistic individuals watch facial expressions, but not when deliberately imitating them and mu-suppression is reduced when they watch unfamiliar but not familiar others act[5]. Autism too, might thus be better described as an abnormal propensity rather than ability for empathy.

The distinction we propose builds on similar distinctions in other domains. The International Classification of Functioning, Disability and Health urges clinicians to distinguish motor capacity - what someone can do in an optimal lab situation – from motor performance - what a person actually does in the home environment. Similarly, psychometrics distinguish competence and performance. For instance, a toddler could fail a false-belief task either because she lacks a mature theory-of-mind (low competence) or because the task requires other cognitive functions (e.g. working memory) that inadvertently limit performance.

Why propensity and ability dissociate

That changing instructions can boost vicarious activations reveals that empathy is not entirely automatic. Some of the processes behind the ability seem to depend on attention and/or motivation.

Attention

Spontaneously, psychopaths show reduced amygdala activation and fear conditioning, but these responses normalize if their attention is focused towards the emotional dimension of the stimuli – suggesting that abnormal attention might be critical to psychopathy [6]. This account begs the hypothesis that more generally, the degree to which attention is automatically captured by social stimuli should predict people’s propensity for empathy.

Motivation

People seek an optimal level of connectedness, which motivate those less connected to empathize more, and those more connected to empathize less with others[7]. That helping others is costly creates a motivation against empathizing and people down-regulate their empathy in costly helping situations by avoiding empathy inducing stimuli[7]. Empathizing

with someone increases that person's trust, thereby facilitating access to that person's resources. These are just three of the many factors could motivate people away or towards empathy.

Individual differences in attention and motivation could thus turn the knob of empathy up and down, creating individual differences in how strongly propensity and ability dissociate. Patients may then be unusual minima in the distribution of automatical social attention or motivation. Do autistic individuals empathize with fewer individuals [5] because their motivation for connectedness is restricted to fewer individuals? Experiments that systematically alter attention and motivation could explore these factors.

Evolutionarily, an ability to sense the inner states of others is always adaptive: it improves the capacity to predict and adapt to the behavior of others. Always exercising this ability can however be costly: by motivating us to help others, it depletes resources rendering the capacity to down-regulate empathy adaptive. The niche of a species should determine this down-regulation. A competitive niche should select down-regulation; a purely cooperative niche not. The mixed niche so typical of humans would select a mix of individuals with high and individuals with low automatic propensity.

Since David Hume and Adam Smith, helping behaviour is thought to depend on empathy. However, more empathic individuals have only been found to be moderately more likely to help others [8] - why? Because helping is costly, the cost mounts motivation against empathy, and we would thus argue that costly helping of others should depend on the propensity to empathize 'automatically' (Box2) – that part of empathy that occurs without motivation or attention - not on the ability. The association between empathy and costly helping might have been diluted in past research because empathy was measured without distinguishing the ability from the automatic propensity. For example, self-report instruments not always separate these two aspects: "When I watch a good movie, I can very easily put myself in the place of a leading character"[2] or "I can tune in to how someone else feels rapidly and intuitively"[1]: both mix an ability element ('can') and a propensity element ('easily', 'rapidly', 'intuitively'). Social desirability might lead people to overestimate or -report their automatic propensity for empathy. Designing instruments that separately assess ability and propensity, and place participants in relevant situations could test our prediction that the automatic empathic propensity would be a better predictor of costly helping than the empathic ability.

A Social Neuroscience Perspective

Social neuroscience can examine vicarious activations as a proxy of empathy and explore whether and how a capacity-propensity distinction maps onto the brain. Such a mechanistic neural understanding could guide the development of interventions to up- or down-regulate the ability or propensity for various facets of empathy. It would be vain to simply attempt to map the ability for vicarious activations on some brain regions and the propensity on others: if ability is an upper bound, it requires the synergy of all the regions involved in vicarious activations, including those involved in modulating empathy per situation. A number of techniques might however help distinguish two neural systems that relate to our distinction:

a ‘core’ circuit for vicarious activations, that is always necessary for a given facet of empathy, and multiple ‘modulatory’ circuits that drive and modulate the core in specific situations. The propensity for empathy is then approximated by the profile of how strongly the modulatory circuits drive the core circuit as a function of situation; the ability, by the strongest activation of the core circuit via these modulatory circuits.

Meta-Analyses

The core circuit should be common to all situations triggering a facet of empathy whilst modulating circuits should be situation-specific. Meta-analyses of emotional empathy show the anterior insula and the rostral cingulate cortex are activated consistently across very different paradigms triggering emotional empathy, revealing a ‘core circuit’ for emotional empathy. Core circuits also exist for empathy for sensations and actions (Fig. 1a). Other brain regions come online preferentially when emotional empathy is triggered by abstract cues or by explicit images (Fig. 1b blue, red, respectively) and represent ‘modulatory circuits’ for emotional empathy [9].

Lesions

Patients with lesions in the insula seem unable to attribute disgust to others for a wide range of stimuli, linking such a structure to the core circuit for disgust empathy [10]. Lesions in the amygdala, impair spontaneous fear attribution, but if gaze is directed to the eye regions, the impairment disappears, linking such structures to modulatory circuits for empathy [11]. Interestingly, amygdala responses are also often abnormal in psychopathy unless attention is directed to emotions [4, 6]).

Connectivity

Using individual differences in propensity or diagnosis as regressors for resting state or diffusion-weighted images could help identify connectivity features that predispose individuals to a specific propensity profile[12].

Attention and Reappraisal

Research on attention and reappraisal has outlined circuits that allow people to preferentially process stimuli that suit their current goals and motivations [13] and to regulate their own emotions in reaction to social stimuli [14] (Fig. 1c-d), revealing powerful modulatory circuits for empathy.

How to alter the capacity and propensity for empathy

Individual differences in empathy are somewhat stable across the life-span[15], but what is the relative stability of our propensity and capacity for empathy? Which factors alter our propensity and which our ability for empathy? Certain experiences (e.g. piano lessons), can create new motor programs and thus new empathic abilities. Others (e.g. meditation, www.ReSource-Project.org) can encourage us to use our empathic abilities more habitually, thereby altering our propensity. Understanding how to trigger changes in our capacity and propensity, how stable such changes can be, and what neural circuits they rely on is an

important research agenda for understanding individual differences and designing therapies that target specific deficits in patients.

Closing Comments

A deep analysis of how neurons contribute to the ability and propensity for vicarious activations and how this shapes the ability and propensity for empathy will not be easy. However, replacing a univariate notion of trait empathy for each facet with a more multivariate landscape of capacities and propensities shaped by attentional and motivational factors will be necessary to capture the complexity of psychiatric disorders, to help these patients and to understand the striking differences in helping across people and situations.

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Box 1

Empathy, Vicarious Activations and Related Concepts

Vicarious activations

If being in a certain situation systematically activates a set of neurons, the reactivation of any of these neurons while witnessing another in the same situation is what we call vicarious activation. Vicarious activations can relate to different facets: your actions, your sensations, your emotions or even your cognitions.

Operational definition of Empathy

A witness W is showing evidence of empathizing with object O (e.g. a human, animal or object like a robot), if W shows evidence (e.g. neural or behavioural) for the (vicarious) activation of actions, sensations or emotions that he/she would activate in O's stead. The more similar the state of W during witnessing resembles the state W would have in O's stead (i.e. the more vicarious activation), the more W shows evidence of empathy. Empathy is quantified in relation to what W would activate in O's stead, not what O really activates - empathy can be high but inaccurate. We favour this umbrella definition including many related phenomena (e.g. motor mimicry, mirror neurons, emotional contagion, etc.) to facilitate an empirical study of empathy across species and methods. We therefore exclude the metacognitive requirement that W be aware that the vicarious activations represent not his but O's state because establishing whether a non-verbal animal or a neural activation is aware of who is being represented seems impossible. To use vicarious activations as a proxy for empathy does not mean that vicarious activations are necessary and sufficient for empathy. The relation between vicarious activations at the neural level and empathy at the experiential level remains to be clarified.

Facets of Empathy

Empathy can be split into sub-domains or facets. Some assume different facets a priori (e.g. cognitive vs. emotional empathy [1]); others extract them from a factor analysis of self-report questionnaires (e.g. fantasising vs. perspective taking vs. personal distress vs. empathic concern [2]), others still because neuroimaging reveals that different facets (e.g. actions, emotions, sensations, cognitions [3]) engage separable neural systems.

Situation

When W witnesses a specific state of O, we use the term 'situation' broadly to cover the entire situation that triggers empathy (including O), to cover factors that influence how and how-much W empathizes with O by altering for instance the goals of W (e.g. instructions), W's relation to O (e.g. information about O's race, fairness, gender, ingroup/outgroup), the cost of empathy or helping and W's responsibility for O's state.

Box 2

The ability and propensity for empathy and how to measure them

Ability for empathy

The current *potential* of a witness for empathy under optimal situations. Ability is latent: it represents the upper bound of how strongly a person can engage a certain facet of empathy (Figure I, Box 2). Because training or life experiences may alter ability over time, we refer to the *current* upper bound. Empathic ability does not require accuracy (i.e. W may feel what he would have felt in O's stead rather than what O actually felt). In analogy: the ability of a runner would be the highest speed she can run under optimal conditions.

Propensity for empathy

The individual's tendency to empathize as a function of the situation. Because different situations will trigger empathy to different degrees in any given individual, the propensity of the person is a function of the situation. The propensity in a situation (ranging from 0 to 1) multiplied by ability determines empathy in that situation. In analogy, the propensity of a runner depends on situation: for some it is high in a race and low on a vacation beach, for others, high in both.

Encouraging empathy to probe ability

Because ability is the upper bound for that facet of empathy, ability cannot be directly measured: we cannot test all situations. However, placing the participant in a situation that strongly encourages empathy provides a proxy. Experimenters should use instructions (e.g. "Try and feel with the actor in the movie") and objects of empathy (e.g. a romantic partner, a familiar person, a person of the witness ingroup) that encourage empathy. Confederate designs in which the participant and a confederate draw a straw to decide who will be the witness can help maximize ingroup feeling.

Leaving things open to probe *spontaneous* propensity

How likely are you to experience empathy when nothing en- or discourages you from doing so? This spontaneous propensity is best measured using minimal instructions: "please look at the movies carefully" and relatively neutral actors as stimuli.

Discourage empathy to probe *automatic* propensity

Morally the key question is, will you empathize even if doing so is bad for you? To probe this automatic propensity for empathy, one could discourage people from empathizing ("Try to be cold and detached"), distract them from empathizing (a demanding task that diverts attention from the emotions of others), or use situations in which empathy would interfere with goals (e.g. provide financial incentives for participants to take decisions that harm others).

Figure 1. Core vs. modulatory circuits

(a) Some brain regions activate whenever participants empathize with the actions (red), emotions (green) and sensations (blue) of others, independently of the modality or stimuli used. These regions represent core circuits for these facets of empathy. (b) Other brain regions are more activated when emotional empathy is triggered by graphic depictions of bodies in painful situations (red) while others are more activated when triggered by abstract cues (blue). Because situation dependent, these regions represent modulatory circuits. (c) Regions recruited when people bias their attention to serve a specific goal. (d) Regions that

allow people to up- or down-regulate their emotional reaction to social stimuli. [Pannel A and C are artists impressions of data from [3] and [13], photoshopped onto a partially inflated standard brain generated using the software Caret. Pannels B and D, render the published results of meta-analyses [9] and [14], respectively, onto the same standard brain]

Figure I, Box2. Ability and propensity as a function of situation

How strongly we empathize with another person's experience (e.g. an intense pain) is shown on the y-axis but depends on the situation (x-axis). Despite keeping the experience of the object of empathy constant (e.g. 8 out of 10 on a standard pain scale), certain situations (e.g. situation s10) encourage empathy more than others (s40). The former provide a proxy of a witness' ability for empathy (upper limit, dashed line), whilst the profile across situations represents the propensity for empathy. Each facet of empathy has its own ability and propensity plot. Actual empathy of a person P in a situation s_i is then $\text{propensity}_P(s_i) \times \text{ability}_P$. Two individuals (A and B) can have the same ability, but differ in some aspects of propensity, with one experiencing relatively high empathy even in situations discouraging empathy, while the other does not. Two individuals (B and C) might have similarly low empathy in some situations (s40) that discourage empathy, whilst one but not the other has a high ability for empathy.