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REVIEW

Regulating Empathy: Exploring the Process through Agents and Strategies

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ABSTRACT

Empathy is a complex emotional phenomenon that plays a crucial role in promoting cooperation and social cohesion within human society. However, there is ongoing debate regarding the mechanisms that underlie the generation of empathy. While the importance of biological emotional resonance in empathy is widely recognized, the influence of cognitive regulation on empathetic responses cannot be disregarded. This article seeks to review the agents and strategies involved in regulating empathy to construct a dynamic model depicting the process. The model highlights that the impact of specific goals on empathy regulation is not definitive; rather, it depends on an individual's interpretation and pursuit of goals, which can either enhance or hinder empathy. To effectively regulate empathy, individuals employ various emotion regulation strategies, the effectiveness and frequency of which can vary depending on individual and contextual factors. This context provides a specific pathway for understanding the generation of empathy. Further research should be conducted to systematically investigate the regulatory mechanisms of empathy by integrating contextual factors and individual characteristics. Furthermore, it is incredibly important to enhance the impact of empathy on social interactions by utilizing its ability to be controlled for intervention and prediction purposes.

KEYWORDS

Empathy; regulation; goal; assessment; motivation

Introduction

Interest in the emotional state of others and the subsequent generation of corresponding emotions constitute the phenomenon of empathy [1]. Since empathy has an important social function [2–4], it has attracted the attention of many researchers. Laboratory research and personal experiences have yielded evidence that individuals exhibit variations in empathy behavior across circumstances. Scholars commonly refer to these contextual cues, which modify empathy responses, as "factors influencing empathy." Previous studies have investigated the influence of target characteristics [5–7] and situational features [8,9] on individuals empathy responses, revealing reduced empathy toward outgroup members, fictional situations, and unfamiliar faces. These findings have prompted researchers to reflect on and engage in discussions regarding the intrinsic mechanisms underlying the development of empathy.

There are two views on how empathy arises. The first is that empathy involves the automatic simulation of another's emotions that arise unconsciously and rapidly [10–12] and cannot be controlled [13]. From this perspective, when individuals encounter emotional stimuli, a specific sequence of emotional matching is automatically performed [14]. However, people do not always empathize with those around them. For example, when an abuser harms others "without mercy", empathy may not arise at all [15,16]. With this in mind, some researchers have proposed an alternative view: that empathy is a controlled response that individuals can reflect on, control, and modify. In this sense, automated emotional resonance generates the content of empathy, while cognitive processes are the levers that regulate emotional content [17]. Individuals can modulate empathy

in various ways, such as adjusting attention to emotional cues or changing perceptions of emotional information [18,19].

Growing perspectives and research findings suggest that empathy is not solely a completely automated process of emotional sharing; it also involves active regulatory processes. If empathy is understood only as a physiological instinct in response to others' emotions, the role of cognition in empathy is disregarded [20]. In certain contexts, regulatory processes may play a more crucial role in the generation of empathy. In addition to their capacity to facilitate [21,22] or inhibit [23,24] empathic responses, they can also modify emerging empathic responses [25]. Consequently, some researchers propose that "empathy is a choice" [26] and have focused their attention on the formation and regulation of empathy [27,28]. This research trend adopts a rational perspective on empathy, acknowledging that empathy is not merely a spontaneous or innate phenomenon but also involves a top-down regulatory process.

However, research that solely focuses on the "factors influencing empathy" merely provides evidence of the existence of empathy regulation phenomena without offering a comprehensive understanding of the essence and mechanisms underlying empathy regulation. Furthermore, it does not definitively answer whether changes in empathy can be attributed to perceiving emotional cues or the level of expectation for empathic states. Additionally, it is worth noting that a significant body of literature fails to acknowledge the potential for individuals to enhance their empathetic responses when encountering specific factors. In reality, various factors can exert a continuum effect on empathy, either augmenting or diminishing it. Individuals have the capacity to adapt the extent and form of empathy in accordance with their intentions and anticipated goals. Consequently, the regulation of empathy can be perceived as a proactive process that entails managing and generating empathetic responses when confronted with specific stimuli or within particular contexts. This perception implies that empathy regulation is influenced by cognitive components, exerting higher-level control over affective elements within the construct of empathy.

To thoroughly investigate the mechanisms of empathy regulation, we approach empathy regulation as a sequential process. The initiation of this process can be attributed to deliberations concerning various objectives, while the realization of the process is contingent upon the implementation of distinct regulatory strategies. Drawing upon this conceptual framework, we conducted a literature search across various databases including Psychology Database, Web of Science, EBSCO-APA PsycArticles, Elsevier ScienceDirect, and Springer. The search process consisted of four blocks, with "empathy" as a fixed keyword that was combined with various other key terms. Some of the keywords for the collocations are listed in Table 1. Additionally, during the search process, a snowballing procedure was employed to analyze key articles and explore avenues of interest from reference lists. This iterative process was not only designed to achieve an exhaustive review but also aimed to capture research findings from diverse viewpoints.

Our research is divided into three main sections:

(1) We review theoretical models that explore the interaction between cognitive and affective factors of empathy, providing a solid foundation for understanding the complex nature of empathy regulation and its dynamic process.

(2) Considering that individuals engage in empathy regulation to ensure consistency between their anticipated emotional experiences and subjective desires [29,30], we discuss the driving force behind empathy regulation as individuals deliberate on goals, highlighting the roles of both long-term and short-term goals in this process.

(3) When regulating empathy, individuals need to process and evaluate various targets and situational information [31]. This further emphasizes the need for diverse strategies to regulate emotions [32]. Therefore, we explore strategies for empathy regulation by incorporating individual characteristics and contextual factors.

TABLE 1

Collocation keywords

Block 1	Block 2	Block 3	Block 4
Motivation	Mirror neurons	Intergroup relation	Interpersonal emotion
Mental effort	Synchronous emotion	Schadenfreude	Emotion regulation
Choice	Theory of mind	Intergroup conflict	Intervention
Cognitive resources	Emotional contagion	Competition	Well-being
Mental health	Perspective taking	Social identity	Situation selection
Agent	Affect mirroring	Sex difference	Attention modulation
Benefit	Perceptual representation	Attitude	Appraisal
Cost	fMRI	Altruism	Cognitive reappraisal
Cognitive process	Neural mechanisms	Social norms	Emotion regulation strategy
	Event-related potential	Racial bias	

The subsequent sections of this study offer a thorough examination of empathy regulation. Firstly, we analyze the characteristics of empathy regulation by considering how goal-value, individual characteristics-regulation strategies, and contextual factors-regulation strategies align. Secondly, we conceptualize empathy regulation as a conscious decision motivated by specific objectives, leading to the development of an interactive model that describes the process of regulating empathy. The evaluation and cognitive processing of diverse targets by individuals are regarded as the initial phase in implementing empathy regulation. The utilization of regulatory strategies is considered a pivotal mechanism through which effective regulation is accomplished. Consequently, the internal mechanisms governing empathy regulation are elucidated.

Essence of Empathy Regulation: The Interplay between Cognitive and Affective Elements

Research on neurological mechanisms suggests that empathy is associated with distinct activation patterns in both emotional and cognitive brain regions. Specifically, the activity of emotional brain regions, including the inferior parietal lobule, anterior cingulate cortex, anterior insula, and premotor cortex, is separate from the activity of cognitive brain regions, such as the temporoparietal junction, temporal pole, precuneus, posterior cingulate cortex, and medial prefrontal cortex [33]. The activation of emotional brain regions is influenced by the emotional stimulus, while the activation of cognitive brain regions is influenced by the specific task at hand [34]. Recent functional magnetic resonance imaging (fMRI) studies have further delved into the neural processes involved in empathy. One study found that when individuals perceive the emotions of others, two distinct brain regions are activated: the anterior insula, associated with emotional experience, and the dorsal medial prefrontal gyrus, associated with cognitive reasoning [35]. These findings suggest that empathic responses are supported by separate and independent neural systems. Additionally, some researchers propose that the activation of emotional and cognitive brain regions in empathy follows a temporal sequence [36].

Although the separation of the emotional and cognitive components has been elucidated [37], their combined contribution ensures the coherence and stability of emotional experience during the empathic process. As an example, the mimicry/embodiment process that evokes emotional resonance is built upon perceptual processing of emotional cues [38]. Furthermore, research has shown that clear expression of both self- and other-directed emotions can modulate the accuracy of empathy [39]. These findings highlight the importance of considering the interaction between emotional and cognitive components [28,40].

Scholars have utilized theoretical frameworks to elucidate the interplay between cognitive and affective elements in empathy, yielding significant insights into the mechanism of regulating empathy. The following sections expound upon four exemplary models in this regard: the dual-process model and circuit model conceptualize the distinctive effects and neural activation patterns of cognitive and emotional components, emphasizing their relative separability. The early and late appraisal model examines the temporal dynamics of cognitive activity associated with empathy at a microscopic level. The dual-system model provides a macroscopic perspective on empathy regulation, establishing the foundation for investigating the modifiability of empathy from a top-down approach. Table 2 presents a summary of the key features and content of these models.

Dual-process model

Lombardo et al. proposed the cognitive and emotional dual-process model of empathy, under which the generation of empathy involves two executive systems [41]. The first system is an embodied imitation system involving lower-order cognition that is responsible for representing and encoding basic cues and generates emotion sharing in a bottom-up way. The second system is the mentalization system involving higher-order cognition that includes conscious theory of mind and perspective taking as well as unconscious implicit cognitive evaluation. This system is

TABLE 2

Content and characteristics of the cognitive activity model of empathy

Models	Content	Characteristics
Dual process model	System of embodied imitation System of mentalization	Preconditions for the functioning of cognitive activities: the establishment of self-other representations
Circuit model	System of core affective System of theory of mind	The mutual promotion effect of cognitive activity and emotional activity
Early and late appraisal model	Early appraisal Late appraisal	The time phase in which cognitive activity occurs
Dual system model	Cognitive regulation Metacognitive regulation	The decisive role of cognitive regulation in empathy

responsible for reasoning about the mental states of the self and others and acting on emotion sharing in a top-down manner. Before the establishment of a shared representation of the self and others, top-down regulation processes influence emotion sharing in only an implicit way. When the self-other shared representation is established, cognition can reveal the regulation of emotion sharing. This model highlights the independence of emotional and cognitive activities in empathy, especially the importance of establishing self-other representations in time for the regulation of empathy. This is consistent with the basic rule that emotional empathy precedes cognitive empathy [42,43].

Circuit model

Walter proposed the circuit model of empathy, arguing that the generation of empathy involves the core affective system for the representation of shared emotions and the theory of mind system for cognitive processing; in this model, the two systems interact to form a circuit [44]. Thus, the generation of empathy includes two paths. In the first path, the emotional state of others exerts a bottom-up effect, leading individuals to share these emotions. Subsequently, individuals input these emotions into the theory of mind system to achieve an understanding of the emotional and mental state of the object. In the second path, individuals first evaluate and determine the object's mental state (cognitive theory of mind) and then generate the understanding and knowledge of this emotional experience (affective theory of mind). Finally, the emotional information obtained by cognition is sent to the relevant brain regions for representation of shared emotions (core affective system) to elicit an emotional response consistent with that of the object. Thus, in this second path, the priming of the "cold" cognitive processing system activates the "hot" affective system, reflecting the role of cognitive processes in empathy.

The circuit model of empathy reflects the mutual contributions of cognitive and emotional components to empathy and has been verified by some research results. Danziger et al. selected subjects with congenital insensitivity to pain who lacked the basic ability to generate emotional resonance from emotional cues. However, when subjects saw an injured person, the core emotional system representing emotional resonance and the brain regions related to theory of mind were jointly activated, suggesting that the subject was able to generate empathy through cognitive activity alone [21]. Morelli et al. presented two kinds of stimuli to subjects: simple emotional pictures and emotional pictures with a text explanation. Within the same subject, there were obvious differences in empathic responses to the types of stimuli; subjects had stronger empathic responses to emotional pictures with a text explanation [22].

Early and late appraisal model

de Vignemont et al. proposed the early and late appraisal model of empathy, arguing that the cognitive component of empathy can occur in the early or late stage of the empathic response [25]. According to the early appraisal model, individuals preferentially evaluate emotional cues and situational factors before establishing emotional links, using the evaluation results as a prerequisite for empathic responses. Studies have found that empathy is difficult to experience if individuals have negative emotions toward others (such as anger and suspicion) [45] or do not trust them [46] before entering the situation. From this point of view, the cognitive processing of information occurs earlier than the activation of the emotion-sharing network; thus, empathy is not an automatic response triggered by emotional cues but the result of the subject's evaluation of a variety of information. In this regard, Singer et al. stated, "Before empathy is generated, the subject will first decode a series of clues, and the decoding results will determine whether the subject will have empathy for the object" [14].

According to the late appraisal model, when individuals automatically generate emotion sharing, they also evaluate emotional cues and situations, and the evaluation results are used to adjust the existing empathic responses. Singer et al. found that after male subjects learned that their opponents had won the game by cunning tactics, the motivation for revenge exceeded the motivation for caring, and activity in the brain regions associated with empathy significantly decreased, indicating that the cognitive processing of competitive information altered the empathic response [47]. Thus, in the whole process of empathy, two independent systems (cognitive and affective) work in parallel. The cognitive component cannot regulate or inhibit the automatic empathic response; it occurs in the later stage of the empathic response, inhibiting or inducing empathy in a top-down manner.

Dual-system model

Heyes provided a more detailed description of cognitive activity associated with empathy and proposed the dual-system model of empathy generation; this model includes both the automatic process of empathy (System 1) and the cognitive regulation of emotional sharing (System 2) [20]. According to this model, during the regulation of empathy, individuals regulate automatic affective matching at the cognitive or metacognitive level and generate controlled empathic responses by amplifying or inhibiting automatic affective matching, leading individuals to produce two types of behavioral outcomes: prosocial (comfort and help) or antisocial (hinder and interfere). In some special cases, the regulatory system of empathy acts directly on emotional stimuli to override biological affective resonance. For instance, cognitive regulation of affective components in empathy is influenced by cultural background and individual experience. Individuals from collectivist cultures express more empathy than individuals from individualistic cultures. Furthermore, individuals who have undergone meditation training tend to exhibit greater empathy [48]. Conversely, trained medical professionals may exhibit reduced empathy [49].

Notably, the regulation of empathy involves both conscious regulation and unconscious metacognitive regulation. For example, although newborn infants cry in response to the crying of other infants, which is a highly adaptive, automatic, and passive mode of emotional interchange [50], this is generally attributed to an innate

tendency to sense and mirror others' feelings, representing the most primitive form of empathy [51]. However, in a study by Ruffman et al. [52], newborns responded more strongly to the crying of same-aged infants than to that of older infants, indicating that they generated more empathic responses to the former or reduced empathic responses to the latter through unconscious regulation. Therefore, in some specific circumstances, information selection can be either intentional or automatic [53]. However, there is a competitive relationship between information in the context, as cognitive resources are needed to evaluate the importance of cues when filtering the information. In some situations, individuals' perception and evaluation of cues is affected by their own wishes or their emotions and beliefs before entering the situation; thus, processing becomes fast and automatic and does not rely on conscious processing. In this case, the regulation of empathy may be unconscious.

Agents of Empathy Regulation: The Interplay between Long-Term Goals and Short-Term Goals

Emotions, cognitions, and behaviors are influenced by goals; thus, people think twice before they leap. In other words, individuals evaluate goals before they act [54]. In general, there are two main types of goals. From the perspective of biological evolution, the ultimate goal of behavior is to ensure the survival of individuals and populations [55]. In everyday life, individuals often set proximate goals that align with their values and desires, accounting for the circumstances in which they find themselves [56]. High-level goals such as maintaining morality and taking responsibility have longer-term rewards, while lower-level goals such as attaining immediate emotional satisfaction and improving inner states yield short-term gains. Competition or dependency between a larger-later goal and a smaller-sooner goal can influence behavioral decisions. If empathy is regarded as the result of decision making, the individual's pursuit of goals at different levels is the agent driving the regulation of empathy.

Long-term goals for ingroup continuity

Expressing more empathy to the ingroup

Empathy is a biological characteristic preserved through evolution, and these types of characteristics have a distinct feature that is particularly evident in empathy: people tend to care about individuals with whom they can relate [20]. During infancy, while newborn infants show no facial preference for their own or other ethnic groups, 3-month-old infants demonstrate a significant preference for faces from their own ethnic group [57]. These results suggest that despite the absence of facial preferences based on racial differences in the first days of life, infants are able to learn to distinguish between their own racial group and other races through visual exposure to their environment by three months of age and display preferences for different races. Furthermore, adults' awareness of racial differences is acquired during early developmental stages. As individuals mature, their preferences for individuals with similar racial backgrounds, cultures, standpoints and attitudes are expected to become stronger, and they will pay more attention to the faces and emotions of these individuals [6], leading to stronger empathic performance toward members of their ingroup through empathy regulation.

Showing more empathy with ingroup members promotes individuals' ability to adapt to their environment, highlighting its value in parent-child relationships as well as in social interactions. During parental care, caregivers intentionally pay attention to infant emotions [58]. Infants also use emotional signals to attract the attention of their nurturers, especially when their parents are around, babies display more expressions of distress [59]. These factors increase caregivers' empathy for the infant, prompting them to provide assistance to the infant or to change their parental behavior, guaranteeing the quality of early parenting.

In interpersonal communication, individuals usually aim to have frequent and active interactions with ingroup members (especially those with whom they have a close relationship). When individuals try to establish or consolidate a relationship with another person, they intentionally engage with the emotions of the other party [60]. Such expectations motivate and stimulate the interest of individuals to recognize emotion in facial expressions, and they invest more cognitive resources in processing these emotional cues to obtain more accurate insight into the partner's emotions and to improve the accuracy and degree of their empathic responses.

In social cooperation, increased empathy among group members can lead to more prosocial behaviors, promote intragroup cooperation, optimize group relations [61], and reduce the negative effects of intragroup competition. This makes the group more united [62]. In addition, increasing the frequency and intensity of emotional communication can enhance the cohesion of group members in achieving common goals. For example, when members within a group need to take collective action against external threats, they often increase their participation in collective behavior by sharing anger [7]. When perceived social connectedness increases, the activity of the amygdala in response to negative emotions decreases [63], indicating that the effect of ingroup preference on empathy may also increase the individual's experience of positive emotions and reduce personal distress.

The aforementioned results indicate that to enhance group competitiveness, individuals increase empathy levels within the group; this regulation reveals a preference for ingroup members. However, empathy adjustment towards ingroup members is not limited to increases in empathy; it may also lead to a decrease in empathy, a phenomenon that has been attributed to the fact that, in some situations, empathy can become a risk factor in close relationships. To maintain or enhance the quality of these relationships, individuals may intentionally lower their levels of empathy towards individuals close to them.

In romantic relationships, empathy has been found to induce negative judgments about relationship quality [64], excessive emotional sharing with a partner may lead to marriage aversion [65], and accurately perspective taking has been found to induce negative behaviors (e.g., we should break up) [66]. In the context of parent-child relationships,

if caregivers consistently respond to children's emotions by sharing their emotions, such as responding to a child's sadness with their own sadness, it can have negative effects on the child, leading to a decrease in their ability to regulate emotions and adapt socially [67], which may lead to habitual displays of depression and anxiety in children [68].

Therefore, to pursue high-quality relationships that align with their personal goals, individuals may also suppress their empathy for individuals close to them. In other words, although expressing more empathy towards ingroup members is consistent with the long-term goals of empathy regulation, maintaining good internal relationships within the group is fundamental to these goals. To negate the adverse impact of empathy on close relationships, individuals may pretend to be indifferent or pretend to be unaware, thereby further highlighting the importance of context and individual goals in the regulation of empathic expressions towards members of the group.

Inhibited empathy for the outgroup

In social interactions, people tend to categorize individuals and experiences that they encounter into "us" *vs.* "them" [69]. This tendency has an important impact on empathy. Research has found that individuals exhibit empathy biases toward objects based solely on physical distance [70] or differences in cognitive processing [71]. Group biases generated by natural differences such as race or species have an even greater impact on empathy. For example, Westbury et al. assessed skin conductance and self-reports of empathy and found that participants exhibited the strongest empathy toward humans, followed by primates, with the lowest level of empathy toward birds [72]. Azevedo et al. argued that although humans possess innate impulses of empathy toward others, they are more inclined to experience empathy toward individuals who belong to the same group [73]. Group differences resulting from factors such as kinship [74] and professional relationships [75] can also inhibit empathy toward outgroup members when there is no clear racial distinction.

The inhibition of outgroup empathy is closely related to outgroup prejudice. Furthermore, the empathy bias in outgroup prejudice is a learned effect of prejudice rather than the result of innate ingroup preference [76]. Sheng et al. found that when subjects were instructed to focus on the emotional reactions of outgroup targets or were assigned to the same "team" as outgroup targets in an experimental manipulation, the activity in empathy-related brain regions significantly increased for outgroup targets, indicating that the subjects actively improved their empathy performance through the influence of new intergroup relationships [5]. Gutsell et al. found that although the empathy response of white subjects depended on the racial difference of the object, when objects of different races (Black, South Asian, or East Asian) were presented to white subjects as a single "outgroup", the neural empathy response for all objects was similar, indicating that once an outgroup was labeled, participants used consistent standards to regulate empathy [77]. Sessa et al. measured participants' empathic responses to targets of different races using event-related potentials (ERPs) [36]. In the 280–340 ms time window, the inferior frontal gyrus (responsible for emotional resonance) showed stronger activation to same-race targets than to other-race targets. In the 400–750 ms time window, the brain regions responsible for inferring others' experiences (the middle frontal gyrus and temporoparietal junction) did not show differences in activation according to race. The results suggest that the regulation of empathy toward outgroup members primarily centers on emotional sharing. However, in certain contexts, to better attenuate empathy, people extremely underestimate the emotions of targets [78], subjectively reducing the mental processing of emotional stimuli [79] to meet their own empathic expectations. This reflects a proactive regulation of the mentalizing process.

The inhibition of empathy for outgroup members can be analyzed from two perspectives: social interaction and information processing. Regarding social interaction, to maximize benefits and minimize losses, individuals often fail to express empathy for outgroup members, which means that empathy disappears when the subject and object are from different groups. Excessive empathy for outgroup members may reduce the chances of success in intergroup competition due to pity and compassion [80], and bargaining chips may be lost [81]. Therefore, to ensure the dominant position of their own group, individuals will reduce empathic expression (and subsequent helping behaviors) toward outgroup members through top-down regulation [82] and will place a lower value on the life of outgroup objects than on that of ingroup objects [83]. In athletic competition [79], intergroup competition [84], and even when adults [71] or children [85] are randomly assigned to different groups (such as a red team and a blue team), their empathy for outgroup individuals is significantly lower than that for ingroup members. In particular, when the ingroup is in a disadvantaged position relative to that of other groups, individuals may exhibit jealousy [86] and amplified feelings of defeat, which can lead to extreme behavior; alternatively, they may experience aversion [87] and hatred [88], leading to slander, resentment and hostility toward the outgroup; or individuals may take pleasure in the misfortune of others (schadenfreude) and experience a sense of satisfaction [89]. These emotional reactions are additional manifestations of the inhibition of empathy.

From the perspective of emotional processing, there are variations in the information processing and neural activity of individuals in response to members of different groups. For ingroup members, individuals process facial information in a holistic manner, involving more unconscious and automatic processing. The multidimensional representation of emotional information can improve the accuracy and fine-grained nature of emotional cue processing [90]. In contrast, the facial information of outgroup members is processed locally, requiring more time and cognitive resources [91]. This difference in information processing results in the novice/expert effect when individuals process faces with different degrees of similarity to their own face [92]. When processing faces that are similar to their own, individuals' processing is more accurate and more

automatic, and they exhibit a higher degree of empathy. The lack of experience with facial recognition of outgroup members contributes to reduced information perception during facial coding. Since only local processing is carried out when processing facial information, the processing quality and empathetic performance are reduced. With regard to neural activity, individuals exhibit more top-down regulation of perception-behavior coupling in social interaction when perceiving painful states in outgroup targets than when perceiving such in ingroup targets. This is characterized by less activation in the prefrontal cortex [93], resulting in reduced simulation of perceptual information by the primary motor cortex [77]. This reduction may be caused by reduced control of the corticospinal muscle [94].

Short-term goals for the current situation

The causes of behavior can be divided into two categories: the ultimate cause, which is the true cause of a behavior, and the proximate cause, which prompts the behavior to occur in a given situation [2]. In a particular situation, the behavior may not be entirely due to the ultimate cause; instead, the proximate cause may play a key role. If the long-term goal of racial continuity is the ultimate cause of the regulation of empathy, then the short-term goal represents the proximate cause of the regulation of empathy in the current situation, reflecting the individual's subjective aims in the regulation process. An individual's desires, attitudes, and emotions or moods before the situation all impact short-term goals, and a unified goal orientation of "value" and "worth" is formed according to the situation [95]. When goal orientation is applied to empathy, individuals exhibit two opposing empathy motives: facilitation of empathy (altruism) or inhibition of empathy (apathy). Zaki proposed that positive emotional experience, belonging, and social desire are motivations for promoting empathy, whereas avoiding pain, avoiding costs and avoiding interference with competition are motivations for inhibiting empathy [24]. These two types of motives are derived from hedonic motives and instrumental motives [96], which drive individuals to engage in empathy regulation.

Hedonic motivation triggered by short-term goals

Hedonic motivation is the result of the interaction of two opposing emotions in human nature—self-interest and altruism. In some situations, the former is more powerful and drives individuals to maximize pleasure and minimize pain. Such emotional experience bias allows individual regulation to shape empathic outcomes in line with positive experiences [97]. In general, individuals perceive objects expressing pleasant emotions as more socially attractive and easier to get along with [98]; thus, the more pleasant an individual's evaluation of an emotion is, the greater they want to experience it. As a result, individuals intentionally choose such situations and tend to empathize with pleasant emotions. Furthermore, sharing other people's pleasant emotions is a positive interpersonal communication strategy that not only helps both parties grow and develop [99] but also results in a favorable perceived social atmosphere [100]. Research has also found that empathy for pleasant emotions subsequently enhances activity in the globus pallidus and ventral striatum [101], which is associated with positive experiences and expected rewards [102]. Therefore, people consciously increase their empathy for individuals displaying pleasant emotions to establish social relationships and satisfy the need for pleasant emotional states [103].

From another perspective, individuals experience egocentric pain after empathizing with emotions that are unpleasant, increasing activity in brain regions associated with painful or uncomfortable experience, such as the anterior insula and anterior midcingulate cortex [104]. A number of empirical studies have explored the link between empathic experience and actual pain perception. Rütgen et al. analyzed the effects of placebo analgesia and naltrexone on empathy responses. They found that placebo analgesia reduced subjects' levels of empathy, while the combination of naltrexone and placebo analgesia, which can eliminate the analgesic effect of opioids, restored the subjects' empathic experience back to its normal level [105–107]. Meconi et al. found that in the process of empathy, individuals' autobiographical memories are activated; the degree of activation is closely related to emotional reactions, indicating that during empathy, people's recollections of similar emotional experiences increase their empathy responses [108]. These results suggest that pain empathy is based on direct perceptions of pain and neural responses and that people's empathy responses to others' pain are very similar to their own pain processing. In other words, the pain elicited by empathy is equally real and as aversive as one's own experiences. People who are exposed to unpleasant emotions for a long time will experience empathy fatigue and physical and mental discomfort [109]. In particular, when there is a close relationship between the subject and object, experiencing empathy can produce a "cost of care" [110]. The partners of cancer patients, for instance, tend to be depressed due to individual distress [111]. Therefore, driven by the impulse to avoid unpleasant experiences, those who realize that empathizing with others will lead to unpleasant feelings will reduce or suppress it consciously [24].

In certain contexts, to avoid the pain of empathy, individuals may use violent behaviors to prevent the object from continuing to produce negative emotions. Fido et al. concluded that social organisms have a mechanism for inhibiting individuals from acting aggressively toward the source of negative emotional cues, which is called the violence inhibition mechanism (VIM) [112]. This mechanism regulates emotions and behavior, preventing individuals from responding violently to observed anger, impulsivity, or distress. While empathy is an important factor in suppressing violent behavior and promoting the functioning of the VIM, this mechanism can be impaired by emotional problems, leading to decreased emotional control and impulsive or extreme behavior [113]. There is currently no direct evidence that excessive sharing of negative emotions inhibits the functioning of VIM. However, researchers have found that violent behavior is a result of individual psychological resource depletion leading to decreased inhibitory control [114] and is also a manifestation of emotional problems [115]. Furthermore, emotional sharing in empathy can increase the risk of

emotional problems and depression [116], and individuals may also experience social behavioral issues due to personal distress [117]. Therefore, it is reasonable to infer that when an individual's pain caused by empathy reaches a certain level, they will perceive the emotion as an aversive stimulus and use violent methods to alleviate their negative experience. This phenomenon is observed in humans and other social animals. For example, a crying child may provoke a restless father into shouting, and the shriek of a punished monkey will trigger some of its own kind to ride on its head and slap it [118].

Instrumental motivation triggered by short-term goals

People are emotional pragmatists who pursue emotions not because they are pleasant, but because they are useful in a given context; this pursual of useful emotions reflects the role of instrumental motivation for specific goals. For example, when subjects complete a task that requires an investment of cognitive effort, they aim to reduce both pleasant and unpleasant emotions to avoid interference with task completion [119]. Additionally, when subjects participate in a game that requires aggression to perform well, they generate anger even though the emotion is uncomfortable; when subjects participate in a threat avoidance game, they generate fear [120]. These studies suggest that the regulation of emotion can be goal driven rather than entirely focused on the experience of the emotions themselves, which is a quality shared by the regulation of empathy.

The expression of empathy without restraint may result in emotional discomfort for the subject and incur both material and psychological costs. When individuals consider whether to empathize, they also weigh costs and benefits. Sommerville et al. found that infants as young as 18 months are able to evaluate behavioral costs, indicating that the process of weighing costs and benefits is present early in life [121]. Other researchers have argued that people are not always altruistic and demonstrate selective altruism, favoring those within their close social groups, and that they are also influenced by the costs of their actions to maintain a positive self-image [122,123]. As these costs increase, individuals' altruistic behaviors decrease [124], and greater levels of selfishness may be triggered [125]. Empathy has long been considered a motivation for prosocial behavior [126]. Although the effect of empathy on prosocial behavior is influenced by factors such as moral value, social judgment [127], episodic simulation [128,129] and episodic memory [130], it cannot be denied that while empathy increases prosocial behavior, it also has a material cost to the subject. After empathy is experienced, failure to provide aid can induce feelings of guilt in the subject and even exacerbate discomfort due to emotional sharing [131]. Consequently, when individuals empathize with an object, they either act altruistically (providing assistance and experiencing positive affect) or consider the cost of altruism and ignore the object's plight, resulting in feelings of guilt. Given that altruism has costs, it can reduce individuals' adaptability to their environments, particularly when these costs outweigh the benefits of altruism. To avoid such losses, individuals may inhibit the generation of empathy. For instance, people often avoid public donation posters [132], and residents are hesitant to open the door to charity organization promoters [133]. Shoppers also tend to avoid entranceways that have donation facilities [134].

Furthermore, the cognitive process of empathy recruits cognitive resources. Emotional stimuli that trigger empathy include simple emotional information and complex emotional information. Simple emotional information is relayed by basic sensory organs and processed with the mirror neuron system and the emotion representation system to achieve emotional matching, with almost no cognitive involvement from the individual [10,34,135]. However, to process complex emotional information, especially emotionally ambiguous cues, the subject needs to separate and extract the background and content of the cues and infer the state of others through theory of mind or perspective-taking to generate an understanding of the emotional experience of the object [44]. Moreover, empathy requires the subject to avoid self-centered bias to ensure accurate cognition and understanding of others' needs and suffering [136], which all require the mobilization of cognitive resources for processing.

Numerous studies in cognitive psychology, neuroscience, and economics have revealed that humans and some other species tend to avoid tasks that require high levels of mental or physical effort when given a choice. Kool et al. found that when presented with two or more behavioral sequences with different energy requirements or workloads, subjects (including some animal species) gradually learn to choose the least effortful sequence [137]. Even when high cognitive demands are associated with greater monetary rewards, most participants will not choose tasks that require high cognitive effort [138]. This phenomenon is referred to as the "law of less work" or the "law of least effort" [139]. Both mental and physical tasks necessitate effort, and effort itself has costs. From a biological perspective, exerting effort in any form, including mental effort, is detrimental to subjects' ability to adapt to their environments [140]. From an economic standpoint, effort implies that subsequent actions may have potential negative consequences [137]. Thus, people tend to avoid putting in more effort unless there are substantial rewards to be gained [141,142]. As empathy requires cognitive resources to process emotional information, individuals systematically avoid empathizing to prevent cognitive depletion. Cameron et al. [18] measured the relationship between empathy and cognitive cost using an empathy choice task. In eleven experiments, the researchers continuously modified the empathy choice task paradigm (e.g., changing the color of cards, removing card labels, and reducing the difficulty of responses) and found that participants exhibited empathy avoidance due to cognitive depletion. People were more likely to choose nonempathic cards than empathic cards. Furthermore, the higher the cognitive cost scores and the longer participants empathized with others were, the lower their willingness to empathize.

However, individuals may find extremely simple tasks boring yet gain satisfaction from more complex tasks (like trying to understand others), because they find meaning from social interaction. Sometimes, people may show

empathy not only because it is advantageous in social situations but also because they are genuinely interested in other people. Therefore, instrumental motivation does not always lead individuals to avoid feeling empathy towards others. When individuals tend to maintain social relationships [143] and gain social reputation [100], empathy and subsequent prosocial behaviors increase significantly. In particular, after individuals experience feelings of loneliness due to social rejection, they pay more attention to the emotions of others [144]; alternatively, in the presence of a third party, they try their best to express empathy to achieve a favorable reputation [145]. The above results show that the moderating effect of instrumental motivation on empathy is affected by social value orientation. The costs of empathy are objective and quantitative, while the benefits of empathy are related to the subjective assessment of the individual. Approaching or avoiding an empathetic response is the final choice made by individuals after judging its "value" and "worth". Ferguson et al. provided evidence that although subjects tend to avoid effort and are aware that empathy can lead to cognitive depletion, empathy can be generated by monetary rewards, social rewards and moral constraints. When the subject is relatively close to the object of empathy, the cognitive load and aversion of subjects to empathy is the lowest [19]. Furthermore, Jensen et al. discovered a positive correlation between doctors' empathetic behaviors and patient satisfaction. In addition, patient satisfaction was positively associated with the level of activity in the reward systems of the doctor's brain (medial prefrontal cortex) [146]. These results indirectly suggest that doctors may enhance their empathetic behaviors toward patients to experience a sense of professional accomplishment.

Approaches to Empathy Regulation: The Interplay between Contextual Factors and Strategies

The regulation of empathy is closely related to the regulation of emotions, both of which involve active modification of the intensity and duration of emotional responses after individuals perceive that emotions are inconsistent with their own expectations [147]. During the whole process, the individual must understand, predict and regulate his or her own emotions as well as those of others [108]. Therefore, the ability to regulate emotions determines the ability to regulate empathy [148], and the strategies used for emotion regulation also impact empathy regulation.

An emotion regulation strategy results from the interaction between individual attitudes and goals [149]. Attitudes are the tendency to evaluate a target in terms of like or dislike, which drives individuals to act in a manner consistent with their attitude. When individuals hold a positive attitude toward the emotional goal, they use strategies to approach the goal. Conversely, people who are negative about emotional goals are more likely to avoid them [150]. In other words, driven by the agent of regulation, individuals control and modify the expression of empathy through corresponding strategies to achieve the dual realization of attitudes and goals [28]. Generally, individuals use three strategies for the regulation of empathy, namely, situation selection, attention modulation and appraisal [24]. Considering that the use of emotion regulation strategies is closely related to both individual characteristics and contextual factors [151], the following discussion combines both types of variables to more fully explicate the effectiveness and operational mechanisms of empathic regulation strategies.

Situation selection

To achieve a specific goal, individuals make choices about the temporal and spatial dimensions of the situation, approaching or avoiding certain situational information. In the regulation of empathy, such strategies can also shape empathic experiences [152]. In many cases, as soon as the individual notices the object, he or she makes a choice about whether to be empathic [24]. Situation selection is a preventive strategy based on the predicted empathic experience, which helps the individual control empathy before entering the situation.

Numerous studies have demonstrated the effectiveness of situation selection for the modulation of empathy, showing that people control their "exposure" to a situation (i.e., the duration of exposure) to achieve control of empathy [153]. Early studies have found that to control the experience of empathy, individuals avoid posters requesting donations to charities [154] and listening to messages asking for help [155]. Recent studies have found that situation selection is influenced by individual characteristics and contextual factors. Schumann et al. asked subjects to listen to two recordings of objects of different races stating negative events and allowed subjects to fast forward through the recordings as desired. The participants listened longer to recordings from an object of the same race, indicating that the use of situation selection strategies could be influenced by group affiliation [156]. Markovitch et al. found that the motivation for situation selection is simple. Individuals may avoid exposure to certain emotions because they have a negative attitude toward such emotions [157].

Additionally, the use of situation selection was strongly associated with personal beliefs about emotional control. When individuals lack self-efficacy regarding their ability to control emotions, they often engage in this strategy of empathy regulation [158]. Situation selection may be the simplest strategy for empathy regulation. Individuals can shape the trajectory of their emotional experience through a simple decision at an early stage of an emotional event and influence the subsequent empathy process [159]. Therefore, it is the most commonly used strategy [160].

Attention modulation

Whether individuals pay attention to emotional cues and their attentional bias to certain emotions affect the experience of empathy [161]. Thus, a lack of empathy in a given population may lie in the inability of individuals to maintain attention to emotional cues. For example, individuals with ASD exhibit lower levels of empathy in complex situations due to their inability to attend to the emotional cues of objects of empathy [162], and this phenomenon is more pronounced for negative emotions

[163]. Therefore, effective attention to contextual cues is an important precondition for the occurrence of empathy.

To regulate empathy, individuals focus their attention on or away from the emotional cues of the object according to their own desires. A cross-cultural study compared empathic responses to bereaved Americans and Germans. They found that, based on cultural differences, the two groups focused on different emotional information, leading to differences in the experience of empathy. The difference in empathy disappeared when attentional information was manipulated [164]. Other researchers have argued that when individuals are unwilling to empathize with others, they reduce their attention to the "dual focus" of the self and others, instead actively shifting their attention to information irrelevant to emotional cues, thus reducing the processing duration of emotional stimuli. As a result, the accuracy of emotional recognition and the total amount of emotional information processing are reduced, thereby reducing or eliminating empathy [165].

Notably, attention modulation is easily confused with situation selection. There are similarities between the two strategies: in both strategies, individuals screen the emotional clues of the object to control the experience of empathy. However, there are obvious differences between the two strategies regarding the timing of strategy application: situation selection occurs earlier than attention modulation. If the individual makes the decision to avoid the entire situation, the individual will not be exposed to the object's emotional cues due to the lack of spatiotemporal conditions for exposure to the object and thus cannot carry out attention modulation. Therefore, situation selection occurs before attention modulation. However, many researchers have ignored the difference between the two. In a study by Olsson et al. (2016), individuals did not exhibit empathy for the object due to a lack of information about rewards and punishments of outgroup members; however, it was not explained whether the "lack of information about rewards and punishments of individuals toward the object" was due to avoidance of the situation or selectively ignoring the object after entering the situation [166]. Similarly, both Cameron et al. [167] and Balcetis et al. (2006) [168] suggested that individual expectations of empathic outcomes influence attention to emotional cues. The former researchers found that individuals subjectively moved away from the object to avoid emotional depletion, while the latter researchers found that individuals shifted their attention to the emotion of the target object to establish a relationship. However, neither study clearly defined whether individuals chose to enter the situation; thus, the results cannot be used to determine whether situation selection or attention modulation affected empathy. Therefore, the influence of situation selection must be excluded in the examination of the effect of attention modulation on empathy.

Appraisal

Under the appraisal strategy to regulate empathy, individuals induce or inhibit empathy by adjusting their views of the intensity of the emotional state of the target [78,79], evaluating the causes of the emotional state of the object [169,170], or evaluating the benefit or risk-related information of situational factors [171]. These strategies can alter the experience of empathy as well as subsequent behavior [172]; they also require individuals to invest more cognitive resources to avoid the omission of emotional information. In addition, Wu et al. found that the regulation of empathy depends on the executive system; a meta-analysis showed that within executive function [173], only inhibitory control was related to empathy [174]. In other words, individuals need to control themselves to reduce the amount that they take the perspective of others when evaluating emotional cues. Therefore, the appraisal strategy may be related to the inhibitory control capacity of the individual. The above results indicate that the appraisal strategy imposes high cognitive demands.

According to some researchers, appraisal strategies are often used in scenarios that contain elements of competition or conflict. To maximize benefits and minimize losses, individuals should not only remain alert to situational information but also reduce the potential for sympathy and pity by suppressing empathy. Therefore, the assessment of the object's emotion is the most effective strategy for the regulation of empathy in such situations. Notably, the appraisal and interpretation of opponents' emotions in competitions may also lead to "counterempathy", which makes individuals more competitive [175]. To feel justified in feelings of schadenfreude, individuals attribute an object's misfortune to their own actions [176]. When the negative emotion of the object is interpreted as a kind of "retribution", the current misfortune of the object is considered a punishment for the violation of justice, accompanied by counterempathy or schadenfreude and a feeling that "God's millstone turns slowly" [177].

Discussion on the Mechanism of Empathy Regulation

Characteristics of empathy regulation

Empathy is commonly perceived as a passive emotion that individuals struggle to manage. However, this study challenges the notion by viewing empathy as a result of a dynamic decision-making process that is influenced by conflicting goals. Through our analysis of empathy regulation, we shift our focus from empathy and its influencing factors to exploring the trade-offs individuals face between competing goals and values in different social, personal, and environmental contexts. Furthermore, individuals adapt their strategies for regulating empathy based on contextual factors and personal traits. By analyzing the strategies employed to regulate empathy, we aim to identify patterns of empathy regulation in various situations. Therefore, the forthcoming analysis will elucidate the essential attributes of empathic regulation from three distinct angles, considered paramount for a comprehensive understanding of the empathic regulation phenomenon.

Achieving a balance between goals and values

From the perspective of empathy's controllability, individuals do not randomly adjust their levels of empathy. Instead, they govern it based on their evaluations of goals and anticipated empathic experiences. The decisions and trade-offs

individuals make regarding different goals have a profound impact on their empathic behavior. When individuals prioritize certain goals, especially when faced with competing alternatives, the level of empathy fluctuates. This finding highlights the influential role of balancing goals and values in empathy regulation. At this point, the degree of empathy reflects the considerations and compromises individuals make concerning their various goals, establishing a dynamic equilibrium as a notable characteristic of empathy regulation. Throughout this regulatory process, the equilibrium between goals and values brings clarity to the social significance of empathy. For instance, individuals may increase their display of empathy to foster social connections and uphold moral standards. However, they may also reduce their expression of empathy to mitigate the associated psychological and material costs. This balancing act showcases how empathy regulation is not arbitrary but rather shaped by the individual's goals and values.

The balance between goals and values in empathetic regulation embodies the cybernetic concept that individuals select from competing goals at various levels to achieve optimal goal attainment. Cybernetic models illustrate three essential processes that contribute to this balance: goal setting, monitoring the discrepancy between goals and the current state, and managing conflicts [178]. In the context of empathy regulation, goal setting is influenced by individuals' personal values and situational factors. Monitoring goals entails striking a delicate balance between long-term goals and short-term goals. Managing conflicts involves the application of executive functions and regulatory strategies.

However, concerns have been raised among researchers regarding the balance between goals and values in regulating empathy. When individuals shift their focus on empathy solely based on subjective intentions, it can result in selfishness, biases, and other antisocial behaviors [179]. Empathy, in fact, does not conflict with rationality but rather is related to making rational decisions. Therefore, the lack of empathy leading to indifference or empathy biases resulting in unethical behavior cannot be attributed solely to empathy itself but rather to biases formed by individual goal selection and value orientation. In other words, empathy itself is not biased, but rather, the regulation of empathy can lead to biased outcomes. Hence, analyzing the equilibrium between goals and values in regulating empathy not only emphasizes the flexibility of empathy but also cautions researchers to use terms such as "trait" and "capacity" carefully when discussing empathy. Furthermore, it offers a new perspective on the relationship between empathy and morality, empowering individuals to recognize that biases arising from the regulation of empathy can be corrected. This understanding motivates them to strive for more effective ways of genuinely understanding and caring for others.

Striking a balance between individual characteristics and regulation strategies

As a process of pursuing goals, the regulation of empathy involves a complex interplay of reasoning and decision-making. This suggests that individuals need to engage in specific cognitive processes to attain the desired empathic experiences. These cognitive processes necessitate the implementation of particular strategies, which in turn consume cognitive resources. These strategies involve actively contemplating the emotional essence of the situation and exerting efforts to shape the anticipated empathic experience. Consequently, the utilization of these strategies is closely linked to individual characteristics, particularly individuals' beliefs regarding their abilities to control emotions or cognitive functions [158].

Through the analysis of regulation strategies, it has been discovered that situation selection is a proactive strategy that requires the least cognitive resources. It allows individuals to quickly approach or disengage from others' emotions. On the other hand, attention modulation and appraisal strategies consume more cognitive resources. Individuals need to continuously pay attention to emotional cues and use inhibitory control to modify their automatic emotional responses. The mechanisms of these strategies in empathy regulation involve attention bias, which is the tendency for individuals to selectively regulate their reactions to specific stimuli by choosing and integrating information. Although attention bias is commonly observed in everyday situations and demonstrates the efficient utilization of cognitive resources, it is influenced by an individual's motivation and intention during the empathy regulation process. Individuals typically choose to focus on emotional cues that they perceive as valuable, acknowledging them as significant sources of information for generating or adjusting empathy. Specifically, the capacity to interpret emotional cues, particularly through the social understanding of facial expressions, plays a critical role in shaping how individuals display empathy [161]. This understanding empowers individuals to actively respond to the emotions of others, resulting in empathetic reactions and behaviors that align with their objectives.

Ensuring consistency between contextual factors and regulation strategies

The contextual environment is filled with representational information that includes emotions, behaviors, and cognitive processes. While these pieces of information themselves do not have fixed meanings, they acquire special significance within their given context. To effectively navigate through the abundance of information, individuals need to maintain different sensitivities to different pieces of information. They must identify and extract cues that align with their own preferences from intricate and complex information or focus their cognitive resources on ambiguous or incomplete information to gain a better understanding of the intended stimulus. This adaptive behavior, which has been preserved through the process of evolution, underscores the considerable impact of context on psychological processes. Consequently, the contextual effect on empathy is significant and plays a crucial role in determining the regulation of empathy based on the context.

In the process of empathic regulation, contextual factors play a crucial role in determining the selection of regulatory strategies. This phenomenon arises from the fact that individuals are required to not only process the emotional

cues exhibited by the target but also extract pertinent information from the surrounding context. To effectively regulate empathic responses, individuals must direct their attention not only toward emotional cues but also toward integrating implicit information derived from the physical environment [180]. Particularly, situations encompassing elements of competition and conflict are noteworthy, where individuals must not only attend to the emotions and behaviors of others but also assess the underlying interests and risks within the contextual setting. To a considerable extent, these judgments act as "regulators" in individuals' selection of empathy regulation strategies. Thus, situation selection and attention modulation are widely employed strategies in typical circumstances [159,165]. Appraisal emerges as the most efficacious strategy for regulating empathy within competitive or conflict-prone situations [171]. By clarifying the intricate relationship between contextual factors and regulatory strategies, researchers can substantially enhance their understanding of the factors contributing to fluctuations in empathy levels in response to contextual changes.

Process of empathy regulation

Through the discussion of agents and strategies in the regulation of empathy, we have created a dynamic model for the first time to visually illustrate the process of empathy regulation (Fig. 1—Goal-driven process of empathy regulation). This model consists of four components: perception, evaluation, target representation, and adjustment. This dynamic model has two advantages. (1) The model provides a comprehensive explanation of the sequential processes that govern variations in empathy. Although empathy is influenced by biological emotional resonance to some extent, presenting its affective aspects, it also exhibits a more rational side when individuals consciously control and adjust expressions of empathy. Similar to the regulation of other emotions and psychological states, individuals actively regulate empathy to adapt to various contexts and demands [181]. Therefore, the model proposes that the regulation of empathy is the outcome of integrating various target values. Specifically, individuals attribute values to different targets and, through the selection and accumulation of these values, establish the initial stage of regulating empathic responses. Subsequently, individuals utilize diverse strategies to effectively regulate empathy. (2) The model analyzes potential factors that may impact empathy regulation by considering individual characteristics and situational factors. Considering the element of controllability, importantly, empathy is not solely an affective and subjective emotional response but also a response facilitated by rational thinking. Furthermore, it is crucial to acknowledge that the process of empathy regulation is subject to the influence of various underlying factors. Therefore, through a systematic analysis of these factors, researchers can gain a more comprehensive understanding of the regulatory patterns involved. Moreover, this analysis can provide insights into the reasons behind the varying displays of empathy observed across situations, thus prompting researchers to contemplate empathy deficits and fostering curiosity in exploring interventions aimed at enhancing empathy.

As depicted in Fig. 1, when individuals perceive emotional cues, they construct perceptual representations of the object's emotions, thereby activating corresponding neural representations and leading to unconscious imitation of the object's behavior. Subsequently, through physiological feedback, this process generates a bottom-up shared emotional experience [10]. According to Prinz, many human behaviors are automatic reactions of the nervous system triggered by incoming signals [182]. These reactions effortlessly translate perceived information into one's own behavior without the need for conscious intervention. The process of transitioning from perception to unconscious imitation is highly automated and involves mirror neurons, as well as memory systems such as episodic memory or autonomous awakening. For instance, when individuals witness an object displaying pain or fear due to a dog attack, the neural representations and episodic memory associated with fear and pain are activated, accompanied by physiological responses. This ultimately leads the individual to experience the same emotions as the object.

Biological emotional resonance is essential for driving the initial impulse for empathy, facilitating emotional exchange between individuals. However, the cognitive

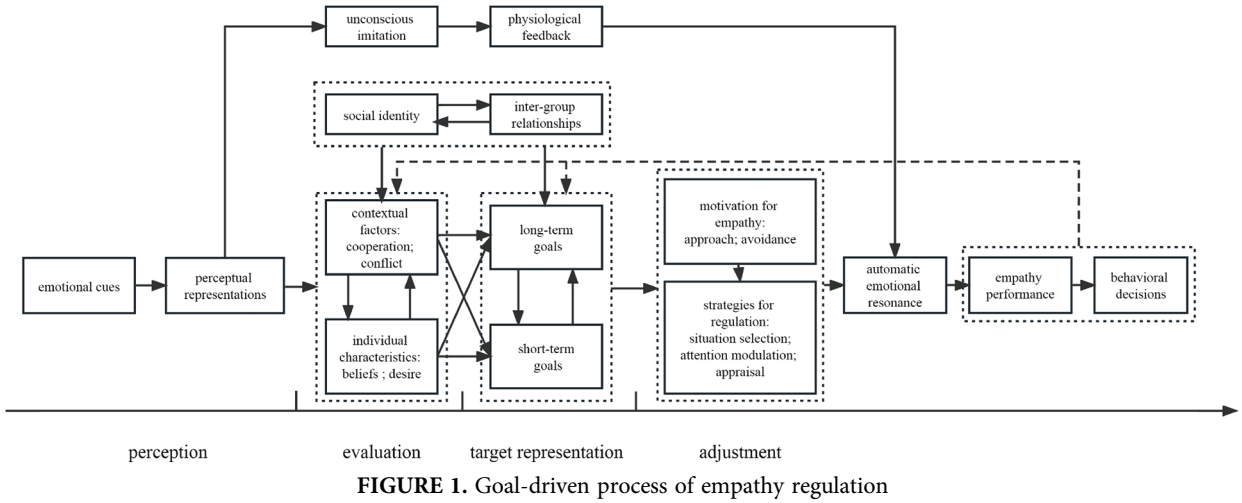

FIGURE 1. Goal-driven process of empathy regulation

aspects of empathy cannot be disregarded. Cognitive processes, such as understanding the views and intentions of others, are essential in shaping empathetic responses. In fact, individuals use situational cues and personal goals to orient themselves toward a target, intentionally amplifying or reducing their empathetic responses. This target orientation plays a crucial role in determining the direction and intensity of empathetic responses and provides individuals with control over their empathetic reactions. Hence, empathy is a product of both affective and cognitive processes in certain situations. Individuals regulate their empathetic responses through cognitive strategies, ensuring that they align with their goals. During the evaluation stage, individuals engage in a process of evaluation, considering contextual factors as well as their own beliefs and desires [183]. The result of this evaluation shapes the balance between long-term and short-term goals and generates subjective expectations regarding the likelihood of empathy occurring.

During the target representation stage, the long-term goal of ingroup continuity drives individuals to express more empathy toward ingroup members while inhibiting empathy toward outgroup members, providing their group with a natural advantage in competition. Short-term goals provide a direct impetus for the regulation of empathy, driving individuals to experience empathy consistent with their goals. The effect of these short-term goals is achieved by eliciting hedonic and instrumental motivation. Hedonic motivation involves the individual's intention to pursue immediate emotional satisfaction, while instrumental motivation is related to potential future benefits. Since empathy is a social emotion generated through interpersonal interaction, group identity and intergroup relationships are also peripheral influencing factors in the stages of evaluation and target representation. Notably, from evaluation to target representation, the interrelation of various factors may generate multiple paths by which factors influence the target representation. For example, in the context of intergroup competition, individuals may reduce their empathic performance and prosocial behavior toward ingroup members due to the short-term goal of avoiding costs; however, this goal will be modified by the long-term goal of ingroup continuity.

During the stage of adjustment, the target representation triggers the motivation to adopt or avoid empathy, driving individuals to apply different strategies for the regulation of automatic emotional resonance. These regulation strategies provide an effective means by which individuals can control their empathic responses. Individuals can achieve the goal of inducing or avoiding empathy through the use of these strategies to ensure that the experience of empathy meets their expectations, thereby generating their final empathic response, including the experience of empathy and related behavioral decisions. The process of adjustment may be completed quickly or repeatedly updated according to the changing situation and individual wishes. When individuals perceive that the adjusted experience of empathy does not conform to the requirements of the situation or their own desires (or the situation or individual wishes have changed), they re-evaluate the information and form a new representation of the target, once again undergoing empathic adjustment. This demonstrates that the experience of empathy is determined not only by empathic ability or biological emotional resonance but also by the individual goals and subjective initiative taken in specific situations.

Limitation

This study has constructed a four-stage empathy regulation process model from three levels: situation, agent, and regulatory strategy. Although this model clearly reflects the role of various factors in empathy regulation, due to the limited number of empirical studies, we were unable to adopt meta-analysis or other quantitative methods to verify the various relationships. Specifically, the interrelationships between various factors from the evaluation stage to the target representation stage only reflect the direction of the path, lacking clear summary of the extent of their influence. Additionally, we pointed out in our research (Chapter: Process of empathy regulation) that empathy regulation may be a recursive process, where individuals may revise their empathy goals based on changes in situational information. Whether there are new factors that affect people's cognitive reappraisal during this process remains underexplored in our research. Therefore, the regulatory process of empathy can only be described preliminarily, and a complete theoretical model has not yet been fully developed. Additional research in a broader range of situations is needed to demonstrate and validate the relationships between variables.

Conclusion

The biological basis of emotional resonance is the origin of empathy, which gives individuals a strong drive for emotional sharing. However, the cognitive process of empathy cannot be overlooked. The views and intentions of others, as understood by the subject through cognitive activities, do not simply facilitate empathy. Instead, subjects combine situational cues and their own goals to establish a target orientation, providing control over empathic reactions and determining the direction and strength of empathy.

The regulation of empathy is a dynamic process. The consideration of various objectives drives the process of regulation, and the employment of distinct regulatory strategies sets the stage for achieving regulation. Therefore, the regulation of empathy can be seen as an active choice that signifies people striving to achieve congruence between their own goals and values in interpersonal emotions. The process of choice requires individuals to make judgments about individual characteristics and contextual factors in order to use optimal regulatory strategies.

Recommendations of Future Research

Empathy regulation and mental health

There is a complex relationship between empathy and mental health. Some researchers believed that empathy can increase the risk of depression [184], and is associated with more anxiety and stress [185]. For special occupational groups

(e.g., healthcare workers, rescue personnel, psychological therapists), they are exposed to negative emotions of others for a long time, and may experience personal distress due to frequent sharing of unpleasant emotions. Accumulated personal distress can be a potential risk factor for inner discomfort, resulting in empathy fatigue and potentially causing depression or severe job burnout [108]. However, some researchers hold the opposite view and consider empathy as a positive factor that protects mental health. Powell argues that individuals with higher empathy ability often have skilled emotion regulation abilities that can counteract common emotional problems. In his study, he also found a negative correlation between cognitive empathy and depression, anxiety, and stress levels [186]. Zhang et al. also showed that individuals with higher empathy abilities tend to pay more attention to the perspectives and attitudes of others and reduce the risk of depression through appropriate and efficient communication [187]. From these two opposing views, it can be found that the cognitive process in empathy may be a moderating variable between empathy and mental health.

Empathy regulation refers to an interactive process involving emotional and cognitive components, in which people can reinterpret emotional events or change their psychological distance with the object through cognitive regulation, thereby affecting their emotional reactions top-down [188]. Studies have shown that individuals with emotional disorders often have higher depression scores [189], while those who are skilled at emotional regulation strategies can effectively reduce their experience of unpleasant emotions [190]. This suggests that empathy regulation, as an interpersonal emotional regulation strategy, can serve as a means of self-protection and may also be an effective way to cope with emotional issues, particularly for special occupational groups. However, researchers have also found that different emotional regulation strategies have different effects. For example, cognitive reappraisal and expressive suppression can both regulate emotions, but cognitive reappraisal is more effective in reducing unpleasant emotions [190,191]. Therefore, future research could explore how to promote good mental health from the perspective of empathy regulation, identifying factors that protect against mental health issues within the dynamic process of empathy regulation.

Moreover, prioritizing empirical investigations on empathy regulation strategies is an essential focus of training empathy regulation abilities among special occupational groups. Investigators can use technologies, such as virtual reality technology [192], to instruct special occupational groups on how to regulate their empathy. The optimal training outcome should be that special occupational groups can avoid avoiding empathy by ignoring, forgetting, numbing, and avoiding, and instead use more proactive and professional help to eliminate the uncomfortable experience of the others, enabling them to neutralize empathy fatigue with a sense of achievement from work. This could have important implications for promoting mental health and job performance among special occupational groups.

Interaction of individual characteristics and contextual factors

Empathy is influenced by individual characteristics and contextual factors. For example, a study conducted by Zhao et al. [193] discovered the impact of the interaction between culture and gender on empathy levels among individuals of diverse ethnicities. Only by considering the interaction between these factors can we obtain a clearer understanding of the process and outcome of empathy regulation. Although some studies have examined how these factors interact, these studies examined only a few factors; more microscopic studies are needed to describe the mechanisms involved. In the stages of evaluation and target representation, individuals ascribe different meanings to situational information according to their own desires. How does the interaction of individual characteristics (age, experience, sex, and emotional state) and situational factors (interpersonal distance from the object of empathy and competitive relationship) affect empathy regulation? In the stage of adjustment, the extraction, integration and interpretation of situational cues by individuals affects their use of empathy regulation strategies. Do the role, status, self-efficacy and attribution style of individuals jointly contribute to their use of empathy regulation strategies? Some researchers have proposed that prosocial behaviors are affected by the presence of third parties [145]. Is this effect also reflected in the regulation of empathy? These questions need further investigation in laboratory and real-life scenarios.

Neural mechanisms of empathy regulation

Individuals express more empathy toward ingroup members through empathy regulation, giving their group a natural competitive advantage. However, natural selection is not carried out at only the population level. Individuals are also influenced by natural selection [194]. Brain activity supporting experience sharing and mentalizing is predictive of subsequent helping behaviors that are associated with a cost [195]. Costly altruism may reduce the adaptability of the individual to the environment. Therefore, individuals should not express empathy for ingroup members all of the time and should consider both the costs and benefits [196]. This process involves a tradeoff between individual and group goals, potentially involving the brain regions responsible for processing costs and benefits (e.g., the anterior cingulate gyrus and subgenual anterior cingulate cortex) [197]. However, there is a lack of direct evidence to supporting this hypothesis. Neuroimaging techniques can be applied to achieve more in-depth exploration of the regulation of intragroup empathy in light of the cost-benefit tradeoff and provides more detailed descriptions of the activation of shared or specific brain regions during the different phases of regulation.

Additionally, studies have found that empathy can activate the brain's reward system [198] and that oxytocin can promote prosocial emotions by regulating amygdala activity [199]. These factors tend to trigger emotions of love and care, shifting the experience of empathy from negative and passive personal distress to concern toward others, which leads to a more positive emotional experience [200]. It is not clear whether a similar neural

mechanism contributes to the regulation of empathy and promotes empathy. Future research could combine evaluation of physiological indicators with experimental studies on empathy regulation to provide insights into the neural activity involved in empathy and how to trigger empathy.

Adjustability of empathy used for intervention and prediction

In human society, a lack of empathy is not a positive sign [201]; instead, it reflects a crisis of trust and highlights the increasing levels of indifference and hostility among people. Since today's social relationships are complex and volatile, the importance of forming connections during development is higher than ever; emotional exchange between people needs to cross national and racial boundaries. Therefore, it is worth considering how to take advantage of the ability to modulate empathy to increase empathy between different groups and mitigate prejudice or hatred. Some studies have explored this issue. Targeted intervention or reinforcement can achieve enhanced activation of the anterior insula after individuals perceive negative emotions in outgroup members, indicating that individuals can increase their empathy for outgroup members [202]. Interventions targeting other risk factors and empathic motivations, however, are lacking.

The key to intervention strategies may be perspective-taking to understand others' emotional states. Group preferences and racial stereotypes can reduce empathy toward outgroup members and even result in schadenfreude [80]. Perspective-taking not only reduces stereotypic biases and ingroup bias [203] but also promotes the generation of empathy [204]. Furthermore, the effectiveness of training in cognitive empathy surpasses that of training in emotional empathy [117]. Therefore, interventions that improve individuals' skills in perspective-taking to understand outgroup members' emotional states can achieve beneficial regulation of empathy.

Additionally, research has shown that assistance from outgroups, particularly unexpected assistance, can boost people's empathy towards them, and activation in the empathic brain region, the insula, is also increased [202]. As individuals feel greater social connectedness, the response of the amygdala to negative emotions decreases, indicating that beneficial social interaction can serve as a reward mechanism that alleviates personal distress following empathy [64]. Moreover, stimuli with observable characteristics (e.g., photos of beneficiaries) are more likely to evoke empathic care than stimuli without observable characteristics (e.g., black silhouettes of beneficiaries) [205]. These studies indicate that the attributes of external stimuli can enhance empathic approach motivation. Therefore, researchers should focus on how to establish circumstances that promote empathy by considering the situational dependence of empathy regulation and creating environments that encourage mutual assistance and interaction between different groups. This exploration should aim to guide people to value empathy as a means of improving social life, regulating emotions, and obtaining satisfaction.

Empathy regulation and positive empathy

Positive empathy (sharing in and understanding others' positive emotions) is a new field in the study of empathy [206]. Researchers have compared positive and negative empathy, but the results have been inconsistent. Warren et al. provided subjects with two different sets of voices and found that the empathic response to laughter was higher than that to crying, indicating that individuals have a greater tendency to share the positive emotions of others [207]. In contrast, Perry, Hendler and Shamay-Tsoory found that empathy for positive emotions appears to be more difficult in some contexts, as participants experienced less activation of the empathy-related brain regions after witnessing another person's success (winning a scholarship) than after witnessing another person's misfortune (losing a wallet) [208]. These results indicate that individuals may find it difficult to enjoy the success of others (especially competitors) due to social comparison, competitive threat and other factors. It can be inferred from these two results that the presentation of emotional stimuli and contextual factors affect the experience of empathy differently according to emotional valence. Such inference is consistent with the rule of empathy regulation; that is, the agent of empathy regulation is affected by situational factors, and the strategy and process of empathy regulation are closely related to the individual's evaluation of the value of the goal. Therefore, further research on positive empathy can be carried out from the perspective of empathy regulation to provide methods and ideas for comparing empathy in response to emotions with different valences.

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References

1. Bloom P. Empathy and its discontents. Trends Cogn Sci. 2017;21(1):24–31. doi:10.1016/j.tics.2016.11.004.
2. de Waal FBM. Putting the altruism back into altruism: the evolution of empathy. Annu Rev Psychol. 2008;59:279–300. doi:10.1146/annurev.psych.59.103006.093625.

3. Cuff BMP, Brown SJ, Taylor L, Howat DJ. Empathy: a review of the concept. Emot Rev. 2016;8(2):144–53. doi:10.1177/1754073914558466.
4. Depow GJ, Francis Z, Inzlicht M. The experience of empathy in everyday life. Psychol Sci. 2021;32(8):1198–213. doi:10.1177/0956797621995202.
5. Sheng F, Han S. Manipulations of cognitive strategies and intergroup relationships reduce the racial bias in empathic neural responses. Neuroimage. 2012;61(4):786–97. doi:10.1016/j.neuroimage.2012.04.028.
6. Zhao Q, Neumann DL, Yan C, Djekic S, Shum DH. Culture, sex, and group-bias in trait and state empathy. Front Psychol. 2021;12:561930. doi:10.3389/fpsyg.2021.5619.
7. Goldenberg A, Garcia D, Halperin E, Gross JJ. Collective emotions. Curr Dir Psychol Sci. 2020;29(2):154–60. doi:10.1177/0963721420901574.
8. Meconi F, Doro M, Lomoriello AS, Mastrella G, Sessa P. Neural measures of the role of affective prosody in empathy for pain. Sci Rep. 2018;8(1):219. doi:10.1038/s41598-017-18552-y.
9. Sessa P, Meconi F. Perceived trustworthiness shapes neural empathic responses toward others' pain. Neuropsychologia. 2015;79:97–105. doi:10.1016/j.neuropsychologia.2015.10.028.
10. Preston SD, de Waal FBM. Empathy: its ultimate and proximate bases. Behav Brain Sci. 2002;25(1):1–71. doi:10.1017/S0140525X02000018.
11. Kelly JR, Iannone NE, McCarty MK. Emotional contagion of anger is automatic: an evolutionary explanation. Brit J Soc Psychol. 2016;55(1):182–91. doi:10.1111/bjso.12134.
12. Moody EJ, Reed CL, Van Bommel T, App B, McIntosh DN. Emotional mimicry beyond the face? Rapid face and body responses to facial expressions. Soc Psychol Pers Sci. 2018;9(7):844–52. doi:10.1177/19485506177.
13. Hodges SD, Biswas-Diener R. Balancing the empathy expense account: strategies for regulating empathic response. In: Farrow T, Woodruff P, editors. Empathy in Mental Illness. Cambridge: Cambridge University; 2007. p. 389–407. doi: 10.1017/CBO9780511543753.022.
14. Singer T, Seymour B, O'Doherty J, Kaube H, Dolan RJ, Frith CD. Empathy for pain involves the affective but not sensory components of pain. Science. 2004;303(5661):1157–62. doi:10.1126/science.1093535.
15. Fernandez YM, Marshall WL, Lightbody S, O'Sullivan C. The child molester empathy measure: description and examination of its reliability and validity. Sex Abuse-J Res Tr. 1999;11(1):17–31. doi:10.1177/1079063299.
16. Eklund J, Andersson-Straberg T, Hansen EM. I've also experienced loss and fear: effects of prior similar experience on empathy. Scand J Psychol. 2009;50(1):65–9. doi:10.1111/j.1467-9450.2008.00673.x.
17. Strayer J. Affective and cognitive perspectives on empathy. In Empathy and its development. New York: Cambridge University Press; 1987. p. 218–44.
18. Cameron CD, Hutcherson CA, Ferguson AM, Scheffer JA, Hadjiandreou E, Inzlicht M. Empathy is hard work: people choose to avoid empathy because of its cognitive costs. J Exp Psychol Gen. 2019;148(6):962–76. doi:10.1037/xge0000595.
19. Ferguson AM, Cameron CD, Inzlicht M. Motivational effects on empathic choices. J Exp Soc Psychol. 2020;90:104010. doi:10.1016/j.jesp.2020.104010.
20. Heyes C. Empathy is not in our genes. Neurosci Biobehav Rev. 2018;95:499–507. doi:10.1016/j.neubiorev.2.
21. Danziger N, Faillenot I, Peyron R. Can we share a pain we never felt? Neural correlates of empathy in patients with congenital insensitivity to pain. Neuron. 2009;61(2):203–12. doi:10.1016/j.neuron.2008.11.023.
22. Morelli SA, Rameson LT, Lieberman MD. The neural components of empathy: predicting daily prosocial behavior. Soc Cogn Affect Neurosci. 2014;9(1):39–47. doi:10.1093/scan/nss088.
23. Keysers C, Gazzola V. Dissociating the ability and propensity for empathy. Trends Cogn Sci. 2014;18(4):163–6. doi:10.1016/j.tics.2013.12.011.
24. Zaki J. Empathy: a motivated account. Psychol Bull. 2014;140(6):1608–47. doi:10.1037/a0037679.
25. de Vignemont F, Singer T. The empathic brain: how, when and why? Trends Cogn Sci. 2006;10(10):435–41. doi:10.1016/j.tics.2006.08.008.
26. Hughes BL, Zaki J. The neuroscience of motivated cognition. Trends Cogn Sci. 2015;19(2):62–4. doi:10.1016/j.tics.2014.12.006.
27. de Waal FBM, Preston SD. Mammalian empathy: behavioural manifestations and neural basis. Nat Rev Neurosci. 2017;18(8):498–509. doi:10.1038/nrn.2017.72.
28. Weisz E, Zaki J. Motivated empathy: a social neuroscience perspective. Curr Opin Psychol. 2018;24:67–71. doi:10.1016/j.copsyc.2018.05.005.
29. Millgram Y, Sheppes G, Kalokerinos EK, Kuppens P, Tamir M. Do the ends dictate the means in emotion regulation? J Exp Psychol Gen. 2019;148(1):80–96. doi:10.1037/xge0000477.
30. Tamir M, Vishkin A, Gutentag T. Emotion regulation is motivated. Emotion. 2020;20(1):115–9. doi:10.1037/emo0000635.
31. Ferguson AM. The empathy selection task: evaluating empathy as a subjective value-based choice (Ph.D. Thesis). University of Toronto: Canada; 2023.
32. Cameron CD. Motivating empathy: three methodological recommendations for mapping empathy. Soc Personal Psychol. 2018;12(11):1–13.
33. Zaki J, Ochsner KN. The neuroscience of empathy: progress, pitfalls and promise. Nat Neurosci. 2012;15(5):675–80. doi:10.1038/nn.3085.
34. Fan Y, Han S. Temporal dynamic of neural mechanisms involved in empathy for pain: an event-related brain potential study. Neuropsychologia. 2008;46(1):160–73. doi:10.1016/j.neuropsychologia.2007.07.023.
35. Kogler L, Mueller VI, Werminghausen E, Eickhoff SB, Derntl B. Do I feel or do I know? Neuroimaging meta-analyses on the multiple facets of empathy. Cortex. 2020;129:341–55. doi:10.1016/j.cortex.2020.04.031.
36. Sessa P, Meconi F, Castelli L, Dell'Acqua R. Taking one's time in feeling other-race pain: an event-related potential investigation on the time-course of cross-racial empathy. Soc Cogn Affect Neursci. 2014;9(4):454–63. doi:10.1093/scan/nst003.
37. Sessa P, Meconi F, Han S. Double dissociation of neural responses supporting perceptual and cognitive components of social cognition: evidence from processing of others' pain. Sci Rep. 2014b;4(1):7424. doi:10.1038/srep07424.
38. Thompson NM, Uusberg A, Gross JJ, Chakrabarti B. Empathy and emotion regulation: an integrative account. Prog Brain Res. 2019;247:273–304. doi:10.1016/bs.pbr.201.
39. Eckland NS, Leyro TM, Mendes WB, Thompson RJ. A multi-method investigation of the association between emotional clarity and empathy. Emotion. 2018;18(5):638–45. doi:10.1037/emo0000377.

40. Decety J, Lamm C. Human empathy through the lens of social neuroscience. Scientific World J. 2006;6:1146–63. doi:10.1100/tsw.2006.221.
41. Lombardo MV, Chakrabarti B, Bullmore ET, Wheelwright SJ, Sadek SA, Suckling J, et al. Shared neural circuits for mentalizing about the self and others. J Cogn Neurosci. 2010;22(7):1623–35. doi:10.1162/jocn.2009.21287.
42. Povinelli DJ, Parks KA, Novak MA. Role reversal by rhesus monkeys, but no evidence of empathy. Anim Behav. 1992;44(2):269–81. doi:10.1016/0003-3472(92).
43. Hoffman ML. Empathy and moral development: implications for caring and justice. Cambridge: Cambridge University Press; 2000.
44. Walter H. Social cognitive neuroscience of empathy: concepts, circuits, and genes. Emot Rev. 2012;4(1):9–17. doi:10.1177/1754073911421379.
45. Bar-Tal D, Halperin E. Socio-psychological barriers to conflict resolution. In: Bar-Tal D, editors. Intergroup Conflicts and Their Resolution: A Social Psychological Perspective. New York: Psychology Press; 2011. p. 217–39.
46. Nadler A, Liviatan I. Intergroup reconciliation: effects of adversary's expressions of empathy, responsibility, and recipients' trust. Pers Soc Psychol B. 2006;32(4):459–70. doi:10.1177/0146167205276431.
47. Singer T, Seymour B, O'Doherty JP, Stephan KE, Dolan RJ, Frith CD. Empathic neural responses are modulated by the perceived fairness of others. Nature. 2006;439(7075):466–9. doi:10.1038/nature04271.
48. Valk SL, Bernhardt BC, Trautwein FM, Böckler A, Kanske P, Guizard N, et al. Structural plasticity of the social brain: differential change after socio-affective and cognitive mental training. Sci Adv. 2017;3(10):1700489. doi:10.1126/sciadv.1700489.
49. McFarland DC, Malone AK, Roth A. Acute empathy decline among resident physician trainees on a hematology-oncology ward: an exploratory analysis of house staff empathy, distress, and patient death exposure: acute empathy decline. Psycho-Oncology. 2017;26(5):698–703. doi:10.1002/pon.4069.
50. Zahn-Waxler C, Radke-Yarrow M. The origins of empathic concern. Motiv Emot. 1990;14(2):107–30. doi:10.1007/BF00991639.
51. Liddle ME, Bradley BS, Mcgrath A. Baby empathy: infant distress and peer prosocial responses. Infant Ment Health J. 2015;36(4):446–58. doi:10.1002/imhj.21519.
52. Ruffman T, Lorimer B, Scarf D. Do infants really experience emotional contagion? Child Dev Perspect. 2017;11(4):270–74. doi:10.1111/cdep.12244.
53. Inzlicht M, Legault L, Teper R. Exploring the mechanisms of self-control improvement. Curr Dir Psychol Sci. 2014;23(4):302–7. doi:10.1177/0963721414.
54. Hayden BY, Moreno-Bote R. A neuronal theory of sequential economic choice. Brain Neurosci Adv. 2018;2:1–15. doi:10.1177/2398212818766675.
55. Bateson P, Laland KN. Tinbergen's four questions: an appreciation and an update. Trends Ecol Evol. 2013;28(12):712–18. doi:10.1016/j.tree.2013.09.013.
56. Berkman ET, Hutcherson CA, Livingston JL, Kahn LE, Inzlicht M. Self-control as value-based choice. Curr Dir Psychol Sci. 2017;26(5):422–8. doi:10.1177/0963721417704394.
57. Kelly DJ, Quinn PC, Slater AM, Lee K, Gibson A, Smith M, et al. Three-month-olds, but not newborns, prefer own-race faces. Dev Sci. 2005;8(6):31–6. doi:10.1111/j.1467-7687.2005.0434a.x.
58. Preston SD. The origins of altruism in offspring care. Psychol Bull. 2013;139(6):1305–41. doi:10.1037/a0031755.
59. Valeri BO, Holsti L, Linhares MBM. Neonatal pain and developmental outcomes in children born preterm: a systematic review. Clin J Pain. 2015;31(4):355–62. doi:10.1097/AJP.0000000000000114.
60. Maner JK, DeWall CN, Baumeister RF, Schaller M. Does social exclusion motivate interpersonal reconnection? Resolving the porcupine problem. J Pers Soc Psychol. 2007;92(1):42–55. doi:10.1037/0022-3514.92.1.42.
61. Bernhard H, Fehr E, Fischbacher U. Group affiliation and altruistic norm enforcement. Am Econ Rev. 2006;96(2):217–21. doi:10.1257/000282806777212594.
62. Birkinshaw J. Strategies for managing internal competition. IEEE Eng Manag Rev. 2002;30(3):99–109. doi:10.1109/EMR.2002.1032404.
63. Inagaki TK, Ross LP. Neural correlates of giving social support: differences between giving targeted versus untargeted support. Psychosom Med. 2018;80(8):724–32. doi:10.1097/PSY.0000000000000623.
64. Randall A, Schoebi D. Lean on me: susceptibility to partner affect attenuates psychological distress over a 12-month period. Emotion. 2015;15(2):201–10. doi:10.1037/emo0000043.
65. Saxbe D, Repetti RL. For better or worse? Coregulation of couples' cortisol levels and mood states. J Pers Soc Psychol. 2010;98(1):92–103. doi:10.1037/a001.
66. Ickes W. Empathic accuracy: judging thoughts and feelings. In: Hall JA, Mast MS, West TV, editors. The social psychology of perceiving others accurately. Cambridge: Cambridge University Press; 2016. p. 52–70.
67. Fabes RA, Leonard SA, Kupanoff K, Martin CL. Parental coping with children's negative emotions: relations with children's emotional and social responding. Child Dev. 2001;72(3):907–20. doi:10.1111/1467-8624.00323.
68. Chow ET, Otis JD, Simons LE. The longitudinal impact of parent distress and behavior on functional outcomes among youth with chronic pain. J Pain. 2016;17(6):729–38. doi:10.1016/j.jpain.2016.02.014.
69. Tajfel H, Billig MG, Bundy RP, Flament C. Social categorization and intergroup behaviour. Eur J Soc Psychol. 1971;1(2):149–78. doi:10.1002/ejsp.2420010202.
70. Lomoriello AS, Meconi F, Rinaldi I, Sessa P. Out of sight out of mind: perceived physical distance between the observer and someone in pain shapes observer's neural empathic reactions. Front Psychol. 2018;9:1824. doi:10.3389/fpsyg.2018.01824.
71. Montalan B, Lelard T, Godefroy O, Mouras H. Behavioral investigation of the influence of social categorization on empathy for pain: a minimal group paradigm study. Front Psychol. 2012;3:389. doi:10.3389/fpsyg.20.
72. Westbury HR, Neumann DL. Empathy-related responses to moving film stimuli depicting human and non-human animal targets in negative circumstances. Biol Psychol. 2008;78(1):66–74. doi:10.1016/j.biopsycho.2007.12.009.
73. Azevedo RT, Macaluso E, Avenanti A, Santangelo V, Cazzato V, Aglioti SM. Their pain is not our pain: brain and autonomic correlates of empathic resonance with the pain of same and different race individuals. Hum Brain Mapp. 2013;34(12):3168–181. doi:10.1002/hbm.22133.
74. Bartels A, Zeki S. The neural correlates of maternal and romantic love. Neuroimage. 2004;21(3):1155–66. doi:10.1016/j.neuroimage.2003.11.003.

75. Osofsky MJ, Bandura A, Zimbardo PG. The role of moral disengagement in the execution process. Law Hum Behav. 2005;29(4):371–93. doi:10.1007/s1097.
76. Chiao JY, Mathur VA. Intergroup empathy: how does race affect empat-hic neural responses? Curr Biol. 2010;20(11):478–80. doi:10.1016/j.cub.2010.04.001.
77. Gutsell JN, Inzlicht M. Empathy constrained: prejudice predicts reduced mental simulation of actions during observation of outgroups. J Exp Soc Psychol. 2010;46(5):841–845. doi:10.1016/j.jesp.2010.03.011.
78. Bernstein MJ, Young SG, Brown CM, Sacco DF, Claypool HM. Adaptive responses to social exclusion: social rejection improves detection of real and fake smiles. Psychol Sci. 2008;19(10):981–83. doi:10.1111/j.1467-928.
79. Trawalter S, Hoffma KM, Waytz A. Racial bias in perceptions of others' pain. PLoS One. 2012;7(11):48546. doi:10.1371/journal.pone.0048546.
80. Cikara M, Fiske ST. Their pain, our pleasure: stereotype content and schadenfreude. Ann Ny Acad Sci. 2013;1299(1):52–9. doi:10.1111/nyas.12179.
81. Galinsky AD, Maddux WW, Gilin D, White JB. Why it pays to get inside the head of your opponent: the differential effects of perspective taking and empathy in negotiations: research article. Psychol Sci. 2008;19(4):378–84. doi:10.1111/j.1467-9280.2008.02096.x.
82. Mathur VA, Harada T, Lipke T, Chiao JY. Neural basis of extraordinary empathy and altruistic motivation. Neuroimage. 2010;51(4):1468–75. doi:10.1016/j.neuroimage.2010.03.025.
83. Pratto F, Glasford DE. Ethnocentrism and the value of a human life. J Pers Soc Psychol. 2008;95(6):1411–28. doi:10.1037/a0012636.
84. Riva P, Andrighetto L. Everybody feels a broken bone, but only we can feel a broken heart: group membership influences the perception of targets' suffering. Eur J Soc Psychol. 2012;42(7):801–6. doi:10.1002/ejsp.1918.
85. Masten CL, Gillen-O'Neel C, Brown CS. Children's intergroup empathic processing: the roles of novel ingroup identification, situational distress, and social anxiety. J Exp Child Psychol. 2010;106(2-3):115–28. doi:10.1016/j.jecp.2010.01.002.
86. Lange J, Boecker L. Schadenfreude as social functional dominance regulator. Emotion. 2019;19(3):489–502. doi:10.1177/1745691614527464.
87. Greenier KD. The relationship between personality and schadenfreude in hypothetical versus live situations. Psychol Rep. 2018;121(3):445–58. doi:10.1177/0033294117745562.
88. Berndsen TM, Chapman S. "It wasn't your fault, but …...": Schadenfreude about an undeserved misfortune. Motiv Emot. 2017;41(6):741–8. doi:10.1007/s11031-017-9639-1.
89. Berndsen M, Feather NT. Reflecting on schadenfreude: serious consequences of a misfortune for which one is not responsible diminish previously expressed schadenfreude; the role of immorality appraisals and moral emotions. Motiv Emot. 2016;40(6):895–913. doi:10.1007/s11031-016-9580-8.
90. Sporer SL. Recognizing faces of other ethnic groups: an integration of theories. Psychol Public Pol L. 2001;7(1):36–97. doi:10.1037/1076-8971.7.1.36.
91. Michel C, Corneille O, Rossion B. Race categorization modulates holistic face encoding. Cogn Sci. 2007;31(5):911–24. doi:10.1080/03640210701530805.
92. Sporer SL, Horry R. Recognizing faces from ethnic in-groups and out-groups: importance of outer face features and effects of retention interval. Appl Cogn Psychol. 2011;25(3):424–31. doi:10.1002/acp.1709.
93. Xu X, Zuo X, Wang X, Han S. Do you feel my pain? Racial group membership modulates empathic neural responses. J Neurosci. 2009;29(26):8525–9. doi:10.1523/JNEUROSCI.2418-09.2009.
94. Avenanti A, Sirigu A, Aglioti SM. Racial bias reduces empathic sensorimotor resonance with other-race pain. Curr Biol. 2010;20(11):1018–22. doi:10.1016/j.cub.2010.03.071.
95. Zheng Y, Shen SC, Xu MX, Rao LL, Li S. Worth-based choice: giving an offered smaller pear an even greater fictional value. J Pac Rim Psychol. 2019;13:e10. doi:10.1017/prp.2019.4.
96. Higgins ET. Beyond pleasure and pain: how motivation works. Oxford: Oxford University Press; 2011.
97. Tamir M, Bigman YE, Rhodes E, Salerno J, Schreier J. An expectancy-value model of emotion regulation: implications for motivation, emotional experience, and decision making. Emotion. 2015;15(1):90–103. doi:10.1037/emo0000021.
98. Kashdan TB, Roberts JE. Trait and state curiosity in the genesis of intimacy: diffentiation from related constructs. J Soc Clin Psychol. 2004;23(6):792–816. doi:10.1521/jscp.23.6.792.54800.
99. Andreychik MR. I like that you feel my pain, but I love that you feel my joy: empathy for a partner's negative versus positive emotions independently affect relationship quality. J Soc Pers Relat. 2019;36(3):834–54. doi:10.1177/0265407517746518.
100. Morelli SA, Leong YC, Carlson RW, Kullar M, Zaki J. Neural detection of socially valued community members. Proc Natl Acad Sci USA. 2018;115(32):8149–54. doi:10.1073/pnas.1712811115.
101. Mirabito TZ, Bezdek M, Light SN. Fronto-striatal activity predicts anhedonia and positive empathy subtypes. Brain Imaging Behav. 2019;13(6):1554–65. doi:10.1007/s11682-019-00081-z.
102. Berridge KC, Kringelbach ML. Pleasure systems in the brain. Neuron. 2015;86(3):646–64. doi:10.1016/j.neu.
103. Telle NT, Pfister HR. Positive empathy and prosocial behavior: a neglected link. Emot Rev. 2016;8(2):154–63. doi:10.1177/1754073915586817.
104. Klimecki OM, Leiberg S, Ricard M, Singer T. Differential pattern of functional brain plasticity after compassion and empathy training. Soc Cogn Affect Neur. 2014;9(6):873–9. doi:10.1093/scan/nst060.
105. Rütgen M, Seidel EM, Riečanský I, Lamm C. Reduction of empathy for pain by placebo analgesia suggests functional equivalence of empathy and first-hand emotion experience. J Neurosci. 2015a;35(23):8938–47. doi:10.1523/JNEUROSCI.3936-14.2015.
106. Rütgen M, Seidel EM, Silani G, Riečanský I, Hummer A, Windischberger C, et al. Placebo analgesia and its opioidergic regulation suggest that empathy for pain is grounded in self pain. PNAS. 2015b;112(41):5638–46. doi:10.1073/pnas.1511269112.
107. Rütgen M, Wirth EM, Riečanský I, Hummer A, Windischberger C, Petrovic P, et al. Beyond sharing unpleasant affect-evidence for pain-specific opioidergic modulation of empathy for pain. Cereb Cortex. 2021;31(6):2773–86. doi:10.1093/cercor/bha.
108. Meconi F, Linde-Domingo JS, Ferreira C, Michelman S, Staresina B, Apperly IA, et al. EEG and fMRI evidence for autobiographical memory reactivation in empathy. Hum Brain Mapp. 2021;42(14):4448–64. doi:10.1002/hbm.25557.
109. Zaki J. Integrating empathy and interpersonal emotion regulation. Annu Rev Psycho. 2020;71(1):517–40. doi:10.1146/annurev-psych-010419050830.

110. Figley CR. Compassion fatigue: psychotherapist's chronic lack of self care. J Clin Psycho. 2002;58(11):1433–41. doi:10.1002/jclp.10090.
111. Braun M, Mikulincer M, Rydall A, Walsh A, Rodin G. Hidden morbidity in cancer: spouse caregivers. J Clin Oncol. 2007;25(30):4829–34. doi:10.1200/JCO.2006.10.0909.
112. Fido D, Santo MGE, Bloxsom CAJ, Gregson M, Sumich AL. Electrophysiological study of the violence inhibition mechanism in relation to callous-unemotional and aggressive traits. Pers Indiv Differ. 2017;118:44–9. doi:10.1016/j.paid.2017.01.049.
113. Sun LJ, Li JY, Niu GF, Zhang L, Chang HJ. Reactive aggression affects response inhibition to angry expressions in adolescents: an event-related potential study using the emotional Go/No-Go paradigm. Front Psychol. 2020;11:558461. doi:10.3389/fpsyg.2020.558461.
114. Hagger M, Wood C, Stiff C, Chatzisarantis NC. Self-regulation and self-control in exercise: the strength-energy model. Int Rev Sport Exerc Psychol. 2010;3(1):62–86. doi:10.1080/17509840903322815.
115. Siep N, Tonnaer F, van de Ven V, Arntz A, Raine A, Cima M. Anger provocation increases limbic and decreases medial prefrontal cortex connectivity with the left amygdala in reactive aggressive violent offenders. Brain Imaging Behav. 2019;13(5):1311–23. doi:10.1007/s11682-018-9945-6.
116. Calandri E, Graziano F, Testa S, Cattelino E, Begotti T. Empathy and depression among early adolescents: the moderating role of parental support. Front Psychol. 2019;10:1447. doi:10.3389/fpsyg.2019.01.
117. Zhao Q, Ren Q, Sun Y, Wan L, Hu L. Impact factors of empathy in mainland Chinese youth. Front Psychol. 2020;11:00688. doi:10.3389/fpsyg.2020.00688.
118. de Waal F. Good natured: the origins of right and wrong in humans and other animals. Boston: Harvard University Press; 1996.
119. Erber R, Erber MW. Beyond mood and social judgement: mood incongruent recall and mood regulation. Eur J Soc Psychol. 1994;24(1):79–88. doi:10.1002/ejsp.2420240106.
120. Tamir M, Ford BQ. Choosing to be afraid: preferences for fear as a function of goal pursuit. Emotion. 2009;9(4):488–97. doi:10.1037/a0015882.
121. Sommerville JA, Enright EA, Horton RO, Lucca K, Sitch MJ, Kirchner-Adelhart S. Infants' prosocial behavior is governed by cost-benefit analyses. Cognition. 2018;177:12–20. doi:10.1016/j.cognition.2018.03.021.
122. Xiao E, Houser D. Emotion expression in human punishment behavior. Proc Natl Acad Sci USA. 2005;102(20):7398–401. doi:10.1073/pnas.0502399102.
123. Small DA, Loewenstein G. Helping a victim or helping the victim: altruism and identifiability. J Risk Uncertainty. 2003;26(1):5–16. doi:10.1023/A:1022299422219.
124. Warneken F, Tomasello M. The emergence of contingent reciprocity in young children. J Exp Child Psychol. 2013;116(2):338–50. doi:10.1016/j.jecp.2013.06.002.
125. Okimoto TG, Wenzel M. The other side of perspective taking: transgression ambiguity and victims' revenge against their offender. Soc Psychol Pers Sci. 2011;2(4):373–8. doi:10.1177/1948550610393032.
126. Kamas L, Preston A. Empathy, gender, and prosocial behavior. J Behav Exp Econ. 2021;92:101654. doi:10.1016/j.socec.2020.101654.
127. Fowler Z, Law KF, Gaesser B. Against empathy bias: the moral value of equitable empathy. Psychol Sci. 2021;32(5):766–79. doi:10.1177/0956797620979965.
128. Vollberg MC, Gaesser B, Cikara M. Activating episodic simulation increases affective empathy. Cognition. 2021;209:104558. doi:10.1016/j.cognition.2020.104558.
129. Gaesser B, Shimura Y, Cikara M. Episodic simulation reduces intergroup bias in prosocial intentions and behavior. J Pers Soc Psychol. 2020;118(4):683–705. doi:10.1037/pspi0000194.
130. Gaesser B, Schacter DL. Episodic simulation and episodic memory can increase intentions to help others. PNAS. 2014;111(12):4415–20. doi:10.1073/pnas.14.
131. Baumeister RF, Stillwell AM, Heatherton TF. Guilt: an interpersonal approach. Psychol Bull. 1994;115(2):243–67. doi:10.1037/0033-2909.115.2.243.
132. Pancer SM, McMullen LM, Kabatoff RA, Johnson KG, Pond CA. Conflict and avoidance in the helping situation. J Pers Soc Psychol. 1979;37(8):1406–11. doi:10.1037/0022-3514.37.8.1406.
133. Dellavigna S, List JA, Malmendier U. Testing for altruism and social pressure in charitable giving. Q J Econ. 2012;127(1):1–56. doi:10.1093/qje/qjr050.
134. Andreoni J, Rao JM, Trachtman H. Avoiding the ask: a field experiment on altruism, empathy, and charitable giving. J Polit Econ. 2017;125(3):625–53. doi:10.1086/691703.
135. Fan Y, Duncan NW, de Greck M, Northoff G. Is there a core neural network in empathy? An fMRI based quantitative meta-analysis. Neurosci Biobehav Rev. 2011;35(3):903–11. doi:10.1016/j.neubiorev.2010.10.009.
136. Kanske P, Böckler A, Trautwein FM, Singer T. Dissecting the social brain: introducing the EmpaToM to reveal distinct neural networks and brain-behavior relations for empathy and theory of mind. Neuroimage. 2015;122:6–19. doi:10.1016/j.neuroimage.2015.07.082.
137. Kool W, McGuire JT, Rosen ZB, Botvinick MM. Decision making and the avoidance of cognitive demand. J Exp Psychol Gen. 2010;139(4):665–82. doi:10.1037/a0020198.
138. Westbrook A, Kester D, Braver TS. What is the subjective cost of cognitive effort? Load, trait, and aging effects revealed by economic preference. PLoS One. 2013;8(7):e68210. doi:10.1371/journal.pone.0068210.
139. Inzlicht M, Shenhav A, Olivola C. The effort paradox: effort is both costly and valued. Trends Cogn Sci. 2018;22(4):337–49. doi:10.1016/j.tics.2018.01.007.
140. Kurzban R. The sense of effort. Curr Opin Psychol. 2016;7:67–70. doi:10.1016/j.copsyc.2015.08.003.
141. Apps MAJ, Grima LL, Manohar S, Husain M. The role of cognitive effort in subjective reward devaluation and risky decision-making. Sci Rep. 2015;5(1):16880. doi:10.1038/srep16880.
142. Inzlicht M, Bartholow BD, Hirsh JB. Emotional foundations of cognitive control. Trends Cogn Sci. 2015;19(3):126–32. doi:10.1016/j.tics.2015.01.004.
143. Sened H, Lavidor M, Lazarus G, Bar-Kalifa E, Rafaeli E, Ickes W. Empathic accuracy and relationship satisfaction: a meta-analytic review. J Fam Psychol. 2017;31(6):742–52. doi:10.1037/fam0000320.
144. DeWall CN, Maner JK, Rouby DA. Social exclusion and early-stage interpersonal perception: selective attention to signs of acceptance. J Pers Soc Psychol. 2009;96(4):729–41. doi:10.1037/a0014634.

145. Andreoni J, Bernheim BD. Social image and the 50-50 norm: a theoretical and experimental analysis of audience effects. Econometrica. 2009;77(5):1607–36. doi:10.3982/ECTA7384.
146. Jensen K, Gollub RL, Kong J, Lamm C, Kaptchuk TJ, Petrovic P. Reward and empathy in the treating clinician: the neural correlates of successful doctor-patient interactions. Transl Psychiatry. 2020;10(1):341–6. doi:10.1038/s41398-020-0712.
147. Gross JJ. Emotion regulation: current status and future prospects. Psychol Inq. 2015a;26(1):1–26. doi:10.1080/1047840X.2014.940781.
148. Eisenberg N. Emotion, regulation, and moral development. Annu Rev Psychol. 2000;51(1):665–97. doi:10.1146/annurev.psych.51.1.665.
149. Pekrun R, Stephens EJ. Goals, emotions, and emotion regulation: perspectives of the control-value theory. Hum Dev. 2009; 52(6):357–65. doi:10.1159/000242349.
150. Harmon-Jones E, Harmon-Jones C, Amodio DM, Gable PA. Attitudes toward emotions. J Pers Soc Psychol. 2011;101(6):1332–50. doi:10.1037/a0024951.
151. Zaki J, Williams WC. Interpersonal emotion regulation. Emotion. 2013;13(5):803–10. doi:10.1037/a0033839.
152. Aspinwall LG, Taylor SE. A stitch in time: self-regulation and proactive coping. Psychol Bull. 1997;121(3):417–36. doi:10.1037/0033-290.
153. Hodges SD, Wegner DM. Automatic and controlled empathy. In: Ickes WJ, editors. Empathic accuracy. New York: The Guilford Press; 1997. p. 311–39.
154. Pancer SM. Salience of appeal and avoidance of helping situations. Can J Behav Sci. 1988;20(2):133–9. doi:10.1037/h0079924.
155. Shaw LL, Batson CD, Todd RM. Empathy avoidance: forestalling feeling for another in order to escape the motivational consequences. J Pers Soc Psychol. 1994;67(5):879–87. doi:10.1037/0022-3514.67.5.879.
156. Schumann K, Zaki J, Dweck CS. Addressing the empathy deficit: beliefs about the malleability of empathy predict effortful responses when empathy is challenging. J Pers Soc Psychol. 2014;107(3):475–93. doi:10.1037/a0036738.
157. Markovitch N, Netzer L, Tamir M. What you like is what you try to get: attitudes toward emotions and stuation selection. Emotion. 2017;17(4):728–39. doi:10.1037/emo0000272.
158. Rovenpor DR, Isbell LM. Do emotional control beliefs lead people to approach positive or negative situations? Two competing effects of control beliefs on emotional situation selection. Emotion. 2018;18(3):313–31. doi:10.1037/emo0000353.
159. Gross JJ. The extended process model of emotion regulation: elaborations, applications, and future directions. Psychol Inq. 2015b;26(1):130–7. doi:10.1080/1047840X.2015.989751.
160. Webb TL, Lindquist KA, Jones K, Avishai A, Sheeran P. Situation selection is a particularly effective emotion regulation strategy for people who need help regulating their emotions. Cogn Emot. 2018;32(2):231–48. doi:10.1080/02699931.2017.1295922.
161. Balconi M, Canavesio Y. Is empathy necessary to comprehend the emotional faces? The empathic effect on attentional mechanisms(eye movements), cortical correlates(N200 event-related potentials) and facial behaviour(electromyography) in face processing. Cogn Emot. 2016;30(2):210–24. doi:10.1080/02699931.2014.993306.
162. Adler N, Dvash J, Shamay-Tsoory SG. Empathic embarrassment accuracy in autism spectrum disorder. Autism Res. 2015;8(3):241–9. doi:10.1002/aur.1439.
163. Uljarevic M, Hamilton A. Recognition of emotions in autism: a formal meta-analysis. J Autism Dev Disord. 2013;43(7):1517–26. doi:10.1007/s10803-012-1695-5.
164. Koopmann-Holm B, Tsai JL. Focusing on the negative: cultural differences in expressions of sympathy. J Pers Soc Psychol. 2014;107(6):1092–115. doi:10.1037/a0037684.
165. Todd RM, Cunningham WA, Anderson AK, Thompson E. Affect-biased attentiona as emotion regulation. Trends Cogn Sci. 2012;16(7):365–72. doi:10.1016/j.tics.2012.06.003.
166. Olsson A, McMahon K, Papenberg G, Zaki J, Bolger N, Ochsner KN. Vicarious fear learning depends on empathic appraisals and trait empathy. Psychol Sci. 2016;27(1):25–33. doi:10.1177/0956797615604124.
167. Cameron CD, Payne BK. Escaping affect: how motivated emotion regulation creates insensitivity to mass suffering. J Pers Soc Psychol. 2011;100(1):1–15. doi:10.1037/a0021643.
168. Balcetis E, Dunning D. See what you want to see: motivational influences on visual perception. J Pers Soc Psychol. 2006;91(4):612–25. doi:10.1037/0022-3514.91.4.612.
169. Feather NT. Deservingness and emotions: applying the structural model of deservingness to the analysis of affective reactions to outcomes. Eur Rev Soc Psychol. 2006;17(1):38–73. doi:10.1080/10463280600.
170. Decety J, Echols S, Correll J. The blame Ggme: the effect of responsibility and social stigma on empathy for pain. J Cogn Neurosci. 2010;22(5):985–97. doi:10.1162/jocn.2009.21266.
171. Feng C, Li Z, Feng X. Social hierarchy modulates neural responses of empathy for pain. Soc Cogn Affect Neurosci. 2016;11:485–95. doi:10.1093/scan/nsv135.
172. Brethel-Haurwitz KM, Stoianova M, Marsh AA. Empathic emotion regulation in prosocial behaviour and altruism. Cogn Emot. 2020;34(8):1532–48. doi:10.1080/02699931.2020.1783517.
173. Wu H, Liu X, Hagan C, Mobbs D. Mentalizing during social interaction: a four component model. Cortex. 2020;126:242–52. doi:10.1016/j.cortex.2019.12.031.
174. Yan Z, Hong S, Liu F, Su Y. A meta-analysis of the relationship between empathy and executive function. Psych J. 2020;9(1):34–43. doi:10.1002/pchj.311.
175. Wang S, Lilienfeld SO, Rochat P. Schadenfreude deconstructed and reconstructed: a tripartite motivational model. New Ideas Psychol. 2019;52:1–11. doi:10.1016/j.newidea.
176. Feather NT, Wenzel M, McKee IR. Integrating multiple perspectives on schadenfreude: the role of deservingness and emotions. Motiv Emot. 2013;37(3):574–85. doi:10.1007/s11031-012-9331-4.
177. Shamay-Tsoory SG, Ahronberg-Kirschenbaum D, Bauminger-Zviely N. There is no joy like malicious joy: schadenfreude in young children. PLoS One. 2014;9(7):e100233. doi:10.1371/journal.pone.0100233.
178. Carver CS. Control processes, priority management, and affective dynamics. Emot Rev. 2015;7(4):301–7. doi:10.1177/1754073915590616.
179. Zaki J, Cikara M. Addressing empathic failures. Curr Dir Psychol Sci. 2015;24(6):471–6. doi:10.1177/0963721415599978.
180. Klin A. Attributing social meaning to ambiguous visual stimuli in higher-functioning autism and asperger syndrome: the social attribution task. J Child Psychol Psychiatry. 2000;41(7):831–46. doi:10.1017/S0021963099006101.
181. Barrett. Emotions are real. Emotion. 2012;12(3):413–29. doi:10.1037/a0027555.

182. Prinz W. Perception and action planning. Eur J Cogn Psychol. 1997;9(2):129–54. doi:10.1080/713752551.
183. Balliet D, van Lange PAM. Trust, conflict, and cooperation: a meta-analysis. Psychol Bull. 2013;139(5):1090–112. doi:10.1037/a0030939.
184. Russell M, Brickell M. The "double-edge sword" of human empathy: a unifying neurobehavioral theory of compassion stress injury. Soc Sci. 2015;4:1087–117. doi:10.3390/socsci4041087.
185. Decety J, Bartal IB, Uzefovsky F, Knafo-Noam A. Empathy as a driver of prosocial behaviour: highly conserved neurobehavioural mechanisms across species. Philos T R Soc B. 2016;371(1686):11. doi:10.1098/rstb.2015.0077.
186. Powell PA. Individual differences in emotion regulation moderate the associations between empathy and affective distress. Motiv Emot. 2018;42(4):602–13. doi:10.1007/s11031-018-9684-4.
187. Zhang M, Wang S, Wang Z, Peng X, Fei W, Geng Y, Zhang T. Associations of affective and cognitive empathy with depressive symptoms among a sample of Chinese college freshmen. J Affect Disord. 2021;292:652–9. doi:10.1016/j.jad.2021.05.111.
188. Thompson NM, Uusberg A, Gross JJ, Chakrabarti B. Empathy and emotion regulation: an integrative account. Cogn Emot. 2019;247:273–304. doi:10.1016/bs.pbr.2019.03.024.
189. Tully EC, Ames AM, Garcia SE, Donohue MR. Quadratic associations between empathy and depression as moderated by emotion dysregulation. J Psychol. 2016;150(1):15–35. doi:10.1080/00223980.2014.992382.
190. Schafer JÖ, Naumann E, Holmes EA, Tuschen-Caffier B, Samson AC. Emotion regulation strategies in depressive and anxiety symptoms in youth: a meta—analytic review. J Youth Adolesc. 2017;46(2):261–76. doi:10.1007/s10964-016-0585-0.
191. Wu XF, Guo TT, Tan TT, Zhang WC, Qin SZ, Fan J, et al. Superior emotional regulating effects of creative cognitive reappraisal. Neuroimage. 2019;200:540–51. doi:10.1016/j.neuroimage.2019.06.061.
192. Hales C, Deak CK, Popoola T, Harris DL, Rook H. Improving the quality of patient care and healthcare staff well-being through an empathy immersion educational programme in New Zealand: protocol of a feasibility and pilot study. Methods Protoc. 2021;4(4):89. doi:10.3390/mps4040089.
193. Zhao Q, Neumann DL, Cao Y, Baron-Cohen S, Yan C, Chan RC, et al. Culture-sex interaction and the self-report empathy in Australians and mainland Chinese. Front Psychol. 2019;12:39758. doi:10.17863/CAM.3.
194. Sober E, Wilson DS. Unto others: the evolution and psychology of unselfish behavior. New York: Harvard University Press; 1998.
195. Waytz A, Zaki J, Mitchell JP. Response of dorsomedial prefrontal cortex predicts altruistic behavior. J Neurosci. 2012;32(22):7646–50. doi:10.1523/JNEURO.
196. Olivola CY, Shafir E. The martyrdom effect: when pain and effort increase prosocial contributions. J Behav Decis Making. 2013;26(1):91–105. doi:10.1002/bdm.767.
197. Gangopadhyay P, Chawla M, Dal Monte O, Chang SWC. Prefrontal-amygdala circuits in social decision-making. Nat Neurosci. 2021;24(1):5–18. doi:10.1038/s41593-020-00738-9.
198. Singer T, Klimecki OM. Empathy and compassion. Curr Biol. 2014;24(18):875–8. doi:10.1016/j.cub.2014.06.054.
199. Liu Y, Li S, Lin W, Li W, Yan X, Wang X, et al. Oxytocin modulates social value representations in the amygdala. Nat Neurosci. 2019;22(4):633–41. doi:10.1038/s41593-019-0351-1.
200. Beauregard M, Courtemanche J, Paquette V, St-Pierre É.L. The neural basis of unconditional love. Psychiat Res. 2009;172(2):93–8. doi:10.1016/j.pscychresns.2008.11.003.
201. Konrath SH, O'Brien EH, Hsing C. Changes in dispositional empathy in American college students over time: a meta-analysis. Pers Soc Psychol Rev. 2011;15(2):180–98. doi:10.1177/1088868310377395.
202. Hein G, Engelmann JB, Vollberg MC, Tobler PN. How learning shapes the empathic brain. Proc Natl A Sci. 2016;113(1):80–5. doi:10.1073/pnas.1514539112.
203. Dovidio JF, Ten Vergert M, Stewart TL, Gaertner SL, Johnson JD, Esses M, et al. Perspective and prejudice: antecedents and mediating mechanisms. Pers Soc Psychol B. 2004;30(12):1537–49. doi:10.1177/0146167204271177.
204. Lamm C, Batson CD, Decety J. The neural substrate of human empathy: effects of perspective-taking and cognitive appraisal. J Cogn Neurosci. 2007;19(1):42–58. doi:10.1162/jocn.2007.19.1.42.
205. Genevsky A, Västfjäll D, Slovic P, Knutson B. Neural underpinnings of the identifiable victim effect: affect shifts preferences for giving. J Neurosci. 2013;33(43):17188–96. doi:10.1523/JNEUROSCI.2348-13.2013.
206. Morelli SA, Lieberman MD, Zaki J. The emerging study of positive empathy. Soc Psychol Pers Sci. 2015;9(2):57–68. doi:10.1111/spc3.12157.
207. Warren JE, Sauter DA, Eisner F, Wiland J, Dresner MA, Wise RJS, et al. Positive emotions preferentially engage an auditory-motor "mirror" system. J Neurosci. 2006;26(50):13067–75. doi:10.1523/JNEURO.
208. Perry D, Hendler T, Shamay-Tsoory SG. Can we share the joy of others? Empathic neural responses to distress vs joy. Soc Cogn Affect Neur. 2012;7(8):909–16. doi:10.1093/scan/nsr073.