The functional role of interpersonal dehumanisation and associated brain networks

Lasana T. Harris[1†] & Naira Delgado[2,3]
[1]Department of Experimental Psychology, University College London, London, England
[2]Department Departamento de Psicología Cognitiva, Social y Organizacional, Universidad de La Laguna, San Cristóbal de La Laguna, Spain
[3]Instituto Universitario de Neurociencia, Universidad de La Laguna, San Cristóbal de La Laguna, Spain
[†]email: lasana.harris@ucl.ac.uk

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Abstract
Dehumanisation is typically considered as an intergroup phenomenon, whereby people are reduced to less-than-human status based on group affiliations. However, in everyday life people often disregard the emotional state of others, which could be considered a more subtle form of dehumanisation. In this Review, we examine interpersonal dehumanisation which we define as a failure to infer another person's mental state. First, we describe the functions of interpersonal dehumanisation at three temporal scales: as retrospective justification for past moral violations, as a facilitator of present behaviours, and as a proactive empathy regulation strategy. Next, we consider the brain networks that facilitate and impact daily dehumanisation, specifically, networks associated with social cognition, empathy, and moral decision-making. We conclude by suggesting future research directions for the study of interpersonal dehumanisation and its implications that could inform development of concrete solutions to foster more humane and ethical interactions in everyday life.

[H1] Introduction

The study of dehumanisation—denying another person's full humanity—was reserved for theoretical work[1] until the turn of the 21st century when psychologists devised methods to empirically probe the conditions under which complex emotions are denied to outgroup members[2-3]. Both the theoretical and empirical work considered dehumanisation as an intergroup phenomenon, emphasizing the role of social identity and the reduction of others to less-than-human status based on group affiliations. Yet people often fail to recognise individuals in whom they lack interest after an initial encounter[4]. Social cognition research on person memory suggests that face recognition spontaneously triggers a character, mood, or trait inference of the other person[5]. Thus, such cognitive disregard implies a failure to consider another person's mental state, which could be considered a more subtle form of dehumanisation that occurs at the interpersonal rather than intergroup level.

Interpersonal dehumanisation occurs subtly, and people are often unaware that they have dehumanised a target. Self-report measures are therefore often insufficient for its measurement. Consequently, exploring brain correlates of psychological processes related to mental state inference could be used to indicate that a perceiver has a dehumanised perception of a target (Box 1). In particular, less activity in the social cognition network suggests less engagement of mental state inference processes[6-9], thereby providing an index of interpersonal dehumanisation. Moreover, interpersonal dehumanisation is associated with activity in brain regions associated with psychological processes dependent on mental state inferences, such as empathy[10] and moral decision-making[11]. Such neurocognitive evidence could be informative for understanding the mechanisms underlying interpersonal dehumanisation and its impacts.

In this Review, we examine interpersonal dehumanisation, that is, subtle forms of dehumanisation that occur in routine, daily interactions because of contextual influences, social goals, or motives that discourage inferring another person's mental state[10,12] (as opposed to the blatant or systematic forms of dehumanization based on social group membership; for reviews see refs[13,14]). First, we explore the psychological functions of interpersonal dehumanisation in terms of fulfilling needs related to past, present, and future behaviour. We next describe brain networks implicated in psychological processes related to mental state inference—social cognition, empathy, and moral decision-making—and discuss how they facilitate, moderate, or are impacted by interpersonal dehumanisation. We conclude by outlining key challenges and proposing future directions to advance understanding of interpersonal dehumanisation.

[H1] Functions of interpersonal dehumanisation

Interpersonal dehumanisation might be a daily occurrence in people's lives[15], suggesting that dehumanisation was preserved evolutionarily because it served psychological functions beyond facilitating human atrocities in an intergroup context[16]. These functions relate to social cognitive processes impacted by mental state inferences—specifically, empathic processes and moral decision-making—and can be described as fulfilling psychological needs related to past, present or future behaviour (Figure 1). Each of these temporal frames offers unique insights into interpersonal dehumanisation: retrospectively justifying past actions provides insight regarding the impact of dehumanisation on memory and self-conscious moral emotion processes; facilitating present behaviours provides insight regarding dehumanisation's role as a regulator of internal focus and attention; and regulating future empathic responses provides insights regarding dehumanisation's role as an emotion regulator. It might not be possible to experience multiple temporal frames as distinct motives

for interpersonal dehumanisation, and the role of a particular frame for a specific instance of interpersonal dehumanisation can change over time. Thus, different temporal frames can be applied to the same instance of interpersonal dehumanisation.

[H2] Dehumanisation for retrospective justification

Dehumanisation is often not the root cause of harmful actions but rather emerges as a retrospective mechanism to justify past actions; many acts of violence and harm are driven by a sense of moral justification, such as restoring justice or protecting one's group, and dehumanisation occurs afterward to rationalise these actions and mitigate feelings of guilt or moral dissonance[17-19]. Indeed, intergroup dehumanisation serves as a post-hoc justification for previous ingroup atrocities[20]. For example, white Americans dehumanised Native Americans when they were made aware of and perceived collective responsibility for their ingroup's mass killing of this outgroup[20].

Beyond the intergroup context, behaviour in daily interpersonal interactions can harm or negatively influence others in some way. For example, people lie to coworkers, end romantic relationships, or stop helping someone in need, despite being aware that these actions will cause harm or disadvantage others. Interpersonal dehumanisation might help people make sense of their behaviour and protect against feelings of guilt by providing justification for past harmful behaviour: if the victim is not human, they might not have suffered from the harmful behaviour, making the act less heinous. Such dehumanisation might be projected onto the victim or the perpetrator via self-dehumanisation[21,22].

The link between harmful actions and dehumanisation is at the heart of moral disengagement theory[23], which suggests that dehumanising one's victims helps protect perpetrators from the immoral and emotional consequences of their actions. Undoubtedly, an immoral action violates moral rules and erodes reputation. If the behaviour is impulsive or unplanned, dehumanisation can serve as a post hoc justification that helps maintain a positive self-image despite immoral behaviour.

The retrospective function of interpersonal dehumanisation plays a role in romantic relationships. Conflict avoidance, hostility, insensitive caregiving, and facets of contempt and humiliation are linked to both perpetuating dehumanisation and being the target of dehumanisation[24,25], and dehumanisation is associated with greater teen dating violence[26] and more sexual aggression towards women[27]. The association between sexual violence and dehumanisation of victims supports the retrospective function of interpersonal dehumanisation: the victims have already experienced the degrading behaviour and dehumanising makes subsequent suffering less salient. The fact that such associations are stronger for men more likely to rape[26] or more avoidantly attached to their partner[25] further supports the function. It has been argued that dehumanisation could not be a psychological mechanism underlying complex relationship dynamics because considering the other's mind is of paramount importance to relationship functioning[28,29]. However, such arguments fail to consider that dehumanised perception is context specific, fleeting and malleable to social goals. Put differently, unlike blatant dehumanisation where a group is continuously dehumanised, interpersonal dehumanisation is not a single all-or-none response to a target. Instead, interpersonal occurs in the moment when it is needed to achieve a particular goal and can disappear when other goals are relevant. A target can therefore be both humanised and dehumanised, just not in the same instance.

People intuitively organise the world along moral hierarchies, considering some things as more morally good than others[30]. Dehumanisation is closely linked to such moral hierarchies because people also organise the world along a human hierarchy that overlaps with moral hierarchies[31]. Mistreatment might influence relative human rankings, causing perceptions of one's own and the other's humanity to become inversely related[31]. Such an inverse relationship creates a zero-sum problem: When individuals engage in immoral behaviour within interpersonal interactions, they either accept the repercussions of their actions, thereby maintaining some recognition of their victims' humanity, or they dehumanise their victims to preserve their own sense of humanity. This core idea has been expanded in the tethered humanity hypothesis[32,33], which suggests that an individual's humanity is interconnected with the humanity of others such that victims and perpetrators self-dehumanise in response to interpersonal harm. In this context, reconciliation facilitates regaining full human status and rehumanises the other party. This bidirectional process is disrupted when the victim does not accept the perpetrator's apology or when the perpetrator fails to apologise[32,33].

Finally, both the perpetrator and bystanders might consider violence to be morally justified when victims are dehumanised. Sexual objectification is a form of dehumanisation whereby people are considered sexual objects rather than full human beings[34]. Men who perpetrated more objectification reported less confidence that they could intervene in future sexual risk situations[35]. Thus, sexual objectification not only increases the likelihood of men engaging in sexual aggression[36] but also diminishes their willingness to intervene as bystanders when others are at risk of sexual harm. If violence is not even recognised by bystanders, then behaviour that causes harm seems harmless. Given that such interpersonal dehumanisation targets women (the victims of harm), their retrospective accounts of previous harmful behaviours are often dismissed and ignored. Past harm goes unrecognised because of interpersonal dehumanisation.

In sum, dehumanisation is a powerful strategy to justify actions that have caused harm to others, enabling perpetrators to maintain a positive self-image. As such, moral decision-making might be affected by dehumanised perception because the latter shifts the boundaries of who deserves moral protection, making immoral behaviour justifiable and palatable. Of course, one can intend to cause harm, and dehumanisation might not be relevant in such instances[19]. Understanding the interdependence between the humanity of both perpetrator and victim might be crucial for promoting reconciliation and rehumanisation.

[H2] Dehumanisation to facilitate present behaviour

People modulate their mental state inferences according to specific goals, needs, or demands of the present situation[9,11]. Specifically, dehumanisation might facilitate present behaviour not typically sanctioned for human beings[12], by which we mean behaviours that, although directed towards humans, diverge from the moral or social norms that typically guide such interactions. These behaviours often instrumentalize others, treating them as means to an end rather than as individuals with inherent worth. This present function suggests dehumanisation might be engaged when people are committing behaviours that cause another pain or suffering in the moment. For instance, if an executive or manager must fire an employee due to budget cuts or corporate restructuring, a failure to consider the employee's mental state might facilitate the firing behaviour, making it more palatable than if they considered the employee's mental state, which might bring up unpleasant thoughts about the consequences of the job-loss on the employee[37]. Similarly, medical professionals who inject patients with needles or slice them open during surgery might find these behaviours more palatable if they

dehumanise the patient, viewing them as a broken machine rather than a human who is suffering[38].

Interpersonal dehumanisation has been extensively explored in economic contexts[39] and it can facilitate non-typical behaviours at work via instrumentality—considering a human being as a tool for one's purposes[40]. Different lines of research support the idea that some tasks or actions can lead to the instrumentalization of others, turning people into commodities. Asymmetries in power within employer-employee relationships are particularly relevant in this framework; for example, high-power individuals objectify their subordinates[41], and being in an unequal power relationship at work increases the accessibility of self-interest motivations, which leads to perceiving others instrumentally[42]. In addition, the salience of uncertainty about one's ability to interact with employees increased the objectification of subordinates[43]. These results indicate that interpersonal dehumanisation could be a coping response for people occupying high-power positions, especially when they feel unsure about how to manage their subordinates.

Interpersonal dehumanisation at work can also facilitate subtle forms of exploitation[44,45]. Exploitation involves taking unfair advantage of a social relationship[46,47]. The fairness of a transaction between people is often measured by the distribution of benefits resulting from the transaction[47]. Exploitative managerial practices (including pressuring employees to work extra hours without reward, sacrificing family time for work, or working in unsafe environments) are sometimes not obvious and therefore often go unnoticed[44]. In such situations, psychological processes legitimising these managerial practices can be reinforced by failing to consider the mental state of the workers. The workplace triggers people to think about strategy and make decisions by computing costs and benefits[48]. This mindset facilitates interpersonal dehumanisation of employees.

In addition, greater psychological distance can lead to more dehumanised decision-making; for example, participants with interdependent self-construal (who view their close relationships and group memberships as central to their sense of self) recommended riskier or more painful treatments to interaction partners when their interaction was mediated by technology (video conferencing) than when they interacted face to face[49]. This finding suggests that virtual interactions might promote interpersonal dehumanisation. It is also consistent with the present function of interpersonal dehumanisation because recommending painful treatments requires considering the target's mental state to calibrate recommendations.

Economic contexts and money also promote interpersonal dehumanisation. The salience of money leads to an increased instrumental perception of others. For example, money-primed participants showed a general inclination towards instrumentality during interpersonal relations compared to participants who were not money-primed[50]. Similarly, participants who were asked to imagine winning the lottery and becoming rich or to think about how they would invest a large sum of money dehumanised human targets more than participants in control conditions[51]. These findings suggest that thinking about money promotes dehumanised perception.

An economic view of social relations facilitates another pervasive form of interpersonal dehumanisation motivated by the present: sexual objectification. According to the social interaction model of objectification[52], cost–benefit analysis of objectifying behaviours explains when and why such behaviours are initiated or avoided during social interactions.

Cost-benefit analysis is an instrumentalising behaviour where one treats something as a means to an end. Instrumentality seems to underlie the desire to approach or avoid sexually objectified targets[53]. Although both men and women dehumanised sexually objectified women, women dehumanised to avoid sexually objectified women, perhaps because they did not want be associated with the stereotype, whereas men dehumanised to approach sexually objectified women, perhaps related to stereotype endorsement or sexual attraction. Importantly, this finding implies that dehumanisation is associated with different behavioural outcomes[54]. The ability of the same psychological mechanism to lead to different behavioural tendencies toward a target based on the perceiver's motives suggests a role for dehumanisation in the present, when motives are engaged. Furthermore, sexual objectification might facilitate masculinity affirmation, an impermanent present-focused psychological experience easily lost or threatened[53].

Finally, the present function of interpersonal dehumanisation might be relevant in clinical settings[55,56]. In medical contexts, flexible social cognition[57] might promote optimal decision-making and performance. Specifically, healthcare professionals are expected to optimise their specialised knowledge when making decisions[58] while maintaining efficiency in highly emotionally demanding contexts[59]. Because it is challenging to simultaneously engage in complex medical problem-solving and be empathetic with patients[56], it might be optimal to avoid mental state inferences—and therefore dehumanise patients—in such situations.

Overall, the present function of interpersonal dehumanisation highlights how context and social interaction dynamics influence dehumanisation, demonstrating its pervasive impact on interpersonal relationships. In economic domains, interpersonal dehumanisation is often promoted because the mental state of the other person is less salient relative to financial goals and rewards; financial considerations trigger dehumanisation that promotes utilitarian decisions. In medical domains, interpersonal dehumanisation facilitates efficiency in providing care, enabling typically unsanctioned behaviours in a context where empathy has emotional costs.

[H2] Dehumanisation for proactive empathy regulation

Finally, interpersonal dehumanisation might act as a proactive empathy regulation strategy[60,61]. Empathy is considered a moral emotion (emotions that consider other people's well-being[62]; but see ref[63] for an alternative view of empathy). A cascade of psychological processes leads to the emotional experience of empathy. Consider a perceiver encountering a person experiencing homelessness. The perceiver must first appraise the situation and recognize that targets might require help in such situations. The perceiver must then predict what it would be like to help the target, considering the psychological experience of helping and the physical and/or resource demands of doing so. Next, the perceiver infers the mental state of the target to determine whether and the extent to which they are in distress and resonates with the emotional experience of the target. This affective component is considered the emotional empathic response[60]. This emotion then motivates helping behaviour, perhaps leading the perceiver to give money to the person experiencing homelessness.

This example demonstrates that although empathy can undermine rationality in moral decisions[63], empathy can foster an emotional connection to others, which serves as a foundation for compassion and moral concern that motivates individuals to care about the well-being of others and to act in situations where injustice is present. Indeed, empathy motivates pro-social behaviour potentially because of the rewards associated with such

behaviour[64]. Empathy can thereby complement rational ethical reasoning by contextualizing abstract moral principles in real-world situations and encouraging people to respond to others' suffering.

However, people find the experience of empathy effortful[65] and seek to avoid empathic responses, even when the empathised other is experiencing positive emotions[66]. Because interpersonal dehumanisation reflects a failure to consider a person's mental state, it can inhibit empathic responses because complex moral emotions require information about a target's mental state to trigger subsequent affect[3,4]. Thus, interpersonal dehumanisation might act as a proactive empathy regulation strategy[60] when people predict that an impending social interaction might be unpleasant or require empathy but lack the motivation or resources to engage this emotional process. Such interpersonal dehumanisation might characterise responses to people experiencing homelessness[7] or bystander intervention effects where people fail to help those in need, not due to apathy but rather because they determine that empathy is required but not optimal for them in the context[66].

This prospective function of interpersonal dehumanisation relies on predicting future experiences with the target. Perceivers anticipate social interactions with targets based on the schema associated with the target. For example, participants told that they would be interacting with an individual with schizophrenia showed more fidgeting behaviour than participants told they would be interacting with a heart patient, suggesting that they were anxious about this potential interaction[67]. There is causal evidence that such a predictive mechanism regulates interpersonal dehumanisation: participants dehumanised a person in need more when they were told to expect an unpleasant vs pleasant social interaction with them[60].

Moreover, research on empathy avoidance finds that perceivers are less likely to choose to listen to an empathy-inducing appeal for help from a person experiencing homelessness when they are expecting to be asked to help that person compared to when they are unaware of an impending help request or such a request comes at a low cost[68]. These results suggest that predictions about the target's mental state as well as predictions about the costs and benefits of the social interaction guide subsequent engagement with the target. This cost-benefit analysis is captured by the fact that as the number of targets that require help increases, perceivers predict the amount of emotional or financial help needed and consider their available limited resources, before failing to help the targets[69]. Stated differently, 100 starving children do not become 'just a statistic' that masks the humanity of the children and thereby inhibits helping[70]; rather 100 starving children represent a lot of people in need and therefore beyond a perceiver's capacity to help.

In sum, predicting that another person requires empathy can trigger interpersonal dehumanisation if the perceiver does not have the capacity—emotional, financial, or otherwise—to empathise with the target.

[H1] Associated brain networks

In the previous section we adopted a temporal perspective to explore the functions of interpersonal dehumanisation, defined as a failure to recognize or engage with another person's mental state. In this section we examine three brain networks associated with mental state inference which might be used as an indicator of interpersonal dehumanization or to shed light on the processes underlying this phenomenon (Figure 2): social cognition,

empathy, and moral decision-making networks (see Box 2 for a discussion of additional neural correlates).

The social cognition brain network plays a crucial role in understanding and attributing mental states to others. Consequently, the disengagement of this brain network serves as a key indicator of interpersonal dehumanisation. The logic of this argument only works if the definition of interpersonal dehumanisation is accurate; the social cognition brain network is indeed necessary for considering other minds; and brain activation is not epiphenomenal but drives psychology and behaviour. We consider all three of the above tenets as true, justifying the use of the social cognition brain network engagement as an index of interpersonal dehumanisation.

Interpersonal dehumanisation disrupts both empathy and moral decision-making by impairing the recognition of others' suffering, because both functions depend on mental state inferences. Specifically, mental state inferences are critical for empathic processing because inferring a target's mental state is necessary to know that they are suffering and require empathy. Similarly, most morality is concerned with human suffering, so obscuring the suffering of others eliminates moral aspects of decision-making. Thus, interpersonal dehumanisation—indexed by a lack of social cognition brain network engagement—blocks the perception of others' suffering, reducing empathy and affecting moral decision-making. Importantly, the term 'social cognition' is often used in the literature to include related processes like empathy and moral decision-making (Box 3). However, the brain imaging literature differentiates moral decision-making, empathy, and mental state inferences, suggesting that these processes rely on separable neural mechanisms.

[H2] Social cognition

Social cognition is concerned with psychological processes involved when people think about other people. A reliable brain network is involved when people infer other people's mental states. This social cognition brain network includes the medial prefrontal cortex, precuneus, posterior cingulate cortex, and areas in the temporal lobe extending from the temporal-parietal junction along the superior temporal sulcus to the anterior temporal pole[71-75]. Because this network is involved in mental state inferences[71-75], reduced activity in this network during person perception can be taken as an index of dehumanisation. This argument relies on reverse inferences—inferring psychological function from brain region activity[76]. However, reverse inferences are insightful if there is sufficient evidence for the involvement of specific brain regions or networks in a psychological process[77]. Indeed, the overwhelming evidence of a relationship between the social cognition brain network and mental state inferences[71-75] suggests that this brain network can serve as an index of the psychological process.

Social cognition brain network activity is lower when people view stereotypical images of societal outgroup targets (for example, people experiencing homelessness) compared to other social groups rated as high on either trait warmth or competence (for example, the elderly, business people, or college students)[7,8,11], suggesting that societal outgroup targets are dehumanised. Activity in the social cognition brain network was also lower when participants were involved in violent gameplay to kill an avatar of their enemy combatant while playing a first-person shooter game compared to non-violent gameplay[78]. Because all participants were experienced video-game players and highly familiar with their opponents, these results suggest that participants might not have been dehumanising other players as outgroup

members but rather that interpersonal dehumanisation might have facilitated shooting behaviour.

Research on sexual objectification also reveals differential brain processing of objectified relative to non-objectified targets. Hostile sexist men (that is, men who hold overtly negative attitudes towards women[79]) show a less active social cognition brain network when looking at images of women wearing minimal clothing compared to fully clothed women[6]. This result is consistent with electroencephalography work showing larger N170 amplitudes for inverted versus upright images of people when they were fully clothed but not when they were wearing minimal clothing[80], suggesting that sexualized bodies were treated like objects. Body posture, not skin-to-clothing ratio, drives this effect[81], suggesting that objectification of sexualized bodies is driven by social inference from the image rather than basic perception.

People buying and selling other people in a labour market context also engage in interpersonal dehumanisation, evidenced by social cognition brain network activity[9]. In this paradigm, researchers endowed participants (owners) with money to buy five players to comprise a time estimation team. This team would later compete to earn money for their owners. Owners' social cognition brain network activity was lower when they viewed images of the players they purchased compared to the ones they did not purchase just before the player made a time estimate that could win the owner money. These results suggest that because the outcome for the owner is dependent on the player's ability to get the time estimate correct, that ability was more salient than the owned player's mental state.

The social cognition brain network is also implicated in retaliation decisions. In one study, participants collaborated with a partner to learn a task and partners could punish each other for errors during tests of task learning[82]. Social cognition brain network activity was lower when participants high in fear potentiation felt that they had been punished too severely and planned to retaliate against their partner with a severe punishment compared to partners who did not provoke retaliation. Fear potentiation is a measure of emotional reactivity to threat, suggesting that people more sensitive to potential confrontation from their partner might rely on interpersonal dehumanisation to facilitate retaliatory behaviour. Moral outrage from a sense of injustice might motivate dehumanisation to facilitate revenge.

Together, this collection of research suggests that a variety of contexts are associated with reduced social cognition brain network activity, including interactions with avatars in games and considering administering punishment to a partner. These everyday contexts reflect encounters with other people that are related to past, present, and future functions of dehumanisation.

[H2] Empathy

Experience sharing and mental state inferences constitute two pathways to comprehend and react to another person's internal states[83]. These two routes to understanding others have frequently been investigated as distinct processes[84.85]. Experience sharing is often linked to a process called 'neural resonance' driven by sensory inputs, and entails a spontaneous, bottom-up reaction to empathic stimuli[84,85]. Conversely, inferring mental states involves a top-down set of cognitive processes (including cognitive appraisal, self-other distinction, and perspective-taking), and engages the social cognition network of midline and superior temporal brain structures[84,85]. These structures are typically involved in the capacity to represent states beyond the perceiver's immediate present, such as the future, past, and the

viewpoints of others[85]. Research on these two neurocognitive processes is informative for understanding how dehumanisation works, and the role of empathic mechanisms in it. Social neuroscience research demonstrates that the affective, cognitive, and regulatory components of empathy involve interacting brain circuits[86,87]. The cognitive aspects of empathy—such as emotion understanding and emotion regulation—require perspective-taking (a mental state inference), self-regulation, and executive attention subserved by the medial prefrontal cortex, dorsolateral prefrontal cortex, and temporal parietal junction. These brain regions are also implicated in mental state inferences among other functions, suggesting that cognitive empathy involves mental state inference.

In experimental studies, empathy has been predominantly explored as an emotional reaction that activates brain areas linked to pain such as the anterior and posterior insula, periaqueductal gray, and anterior cingulate cortex, as well as other brain regions beyond the pain matrix including the amygdala, temporal pole, precuneus, and ventral striatum[88-90]. For example, observing others experiencing pain activates part of the brain network that is also activated when people are experiencing pain themselves[91]. More interesting for the study of interpersonal dehumanisation, contextual cues influence neural empathic responses. For example, physicians show patterns of brain activity consistent with a reduced pain empathy response when they are confronted with visual pain stimuli (for example, people being stuck with needles) whereas participants with no medical expertise do not[92]. This result suggests that inhibiting empathy is an emotion regulation response that can facilitate interpersonal dehumanisation in the healthcare context[38]. Related research found that the context where nurses imagined performing a medical procedure (in a hospital or at home) modified their empathic response, indexed by brain activity in the right temporal-parietal junction, the anterior insula and anterior cingulate cortex[93]. Moreover, participants displayed a diminished empathic brain response to physical pain toward minimally clothed women compared to fully clothed women[94]. Together these results highlight that mental state inferences and humanness perceptions are essential for empathic responses[95,96].

Mental state inferences (inferring the intentions behind others' actions) and mirroring (the representation of others' movements, sensory experiences, and emotional expressions within common brain networks) are closely related concepts[97]. Although, the brain regions responsible for mental state inferences and mirroring are distinct and observable in tightly controlled experimental conditions[98,99], these brain circuits work together for more complex empathic functions[100,101]. One study found that perceptions of humanity predict mirroring, indexed by Mu bandwidth suppression[97]. The researchers concluded that the lack of mirroring towards those not perceived as fully human reflects diminished empathy, understanding, and propensity to help.

In sum, the brain regions implicated in empathy go beyond the brain network involved in social cognition to include regions implicated in executive function, interoception, and value calculation, suggesting that empathy is more than an affective response. However, there is also substantial overlap between brain regions implicated in empathy and interpersonal dehumanisation, providing evidence that regulating interpersonal dehumanisation might involve empathic responses.

[H2] Moral decision-making

Moral decision-making recruits brain regions supporting other cognitive processes, including social cognition and executive function[102]. Our discussion of moral decision-making and the brain is subject to a few caveats. First, judgments and decisions engage different brain

regions[103,104], suggesting that they are not the same psychological mechanism. Most of the social psychology and social neuroscience literatures involve moral judgments, not decisions. Second, reviews of the literature suggest that there is more activity in brain regions associated with morality during moral decisions about humans compared to non-human targets such as AI[105,106], suggesting that moral decisions are reserved for targets considered worthy of moral protection. Finally, we consider paradigms where people make moral decisions in economic games (such as the ultimatum game, trust game, third-party punishment game, altruism game, and dictator game). We do not consider coordination games (such as the prisoner's dilemma game), games of chance (such as poker), or inference games (such as beauty-contest games or rock-paper-scissors) because such games require additional complex cognitive processes beyond mental state inferences.

Dehumanisation reduces deontological judgments[107] (judgments based on whether actions are right or wrong, regardless of the consequences) which are supported by affective brain networks[108], not utilitarian judgments[107] (judgments based on an action's consequences) which are supported by cognitive brain networks[108]. One common paradigm used to probe the differences between deontological and utilitarian judgments is the trolley dilemma, where participants must decide whether to act by sacrificing one target to save five others, or not to act allowing the five targets to die[109]. Undergraduate students were more willing to sacrifice traditionally dehumanised targets (such as people experiencing homelessness) to save other undergraduate students in a trolley dilemma task. The judgment to sacrifice dehumanised targets was associated with activity in the anterior cingulate cortex[110], a node in the executive function brain network[111]. Given that the default judgment in this dilemma is deontological—do not sacrifice the single person to save the five people—a judgment to sacrifice the single person presumably requires overriding the default deontological judgment, engaging executive function mechanisms. Thus, this finding suggests that dehumanisation might influence cognitive processes such as executive function.

In another study, targets were humanised by either describing their mental states or were dehumanised by describing their physical characteristics. Participants were primed with the humanised and dehumanised targets before making save versus sacrifice judgments in trolley-like dilemmas. Participants were more likely to save humanised targets than dehumanised targets, and this judgment was associated with greater connectivity between the anterior cingulate cortex and anterior insula[112]. The anterior cingulate cortex is associated with executive function[111] and the anterior insula is associated with interoception (people's ability to perceive their internal bodily states)[113]. This result therefore suggests that executive function impacts on interoception when making moral decisions involving whether or not to sacrifice humanised victims.

Considering another person's mental state also influences brain activation patterns during trust decisions. In one such study, researchers informed participants that profit they received from an investment with a partner was either due to their partner's generosity or their partner's ability to make a profit. The ability condition takes the focus away from the partner's mental state, dehumanising them. Activity in the social cognition brain network when participants were deciding with whom to invest predicted activity in the striatum, part of the valuation and learning brain network[114], when they received feedback regarding the outcome of their investment. This result suggests that social cognition moderated the engagement of valuation brain regions such that the brain response to outcomes is influenced by the extent to which social cognition was engaged during decision-making This result

provides further evidence that interpersonal dehumanisation might influence other cognitive process; here valuation processes are affected by social cognition.

In sum, there is evidence that interpersonal dehumanisation facilitates moral decision-making. Such facilitation is expected given that mental state inferences are necessary for moral judgments and decisions[115]. Consequently, dehumanised targets are processed differently than fully humanised targets, justifying immoral behaviour against them.

[H1] Summary and future directions

In the past two decades, the empirical study of dehumanisation has flourished and expanded beyond intergroup dynamics to everyday interpersonal contexts. The analysis of psychological functions that interpersonal dehumanisation serves with respect to past, present, and future actions is crucial for understanding dehumanisation's impact on daily social interactions. For example, dehumanisation enables justification of past actions that have caused harm to others, enabling perpetrators to maintain a positive self-image. In the present, dehumanisation enables efficient cognitive processes within a specific context, making goals more relevant. Dehumanisation can also regulate empathic responses when people predict empathy is necessary but do not have the resources to empathise. Future research can continue to refine these functions, further specifying the impact of dehumanisation on self-perception, outlining other efficiency benefits of dehumanisation, and exploring whether dehumanisation can regulate other moral emotions beyond empathy (Box 4).

Neuroscience research conducted to date underscores the complexity of the brain networks underlying interpersonal dehumanisation and its broader psychological impacts on everyday social interactions. The social cognition brain network is less active in response to a variety of targets in a variety of contexts, suggesting that interpersonal dehumanisation is not inherent to specific targets or contexts. The empathy and morality brain networks include brain regions associated with other psychological processes beyond social cognition or affective processes, suggesting that empathy and morality are complex psychological processes dependent on a humanised perception. Future research on neural substrates should address whether blatant forms of dehumanisation rely on the same mechanisms, and whether they are uniquely influenced by context (for example, social interactions in casual versus professional contexts).

Future research should also explore effective intervention strategies to reduce interpersonal dehumanisation, especially in healthcare and workplace settings. For instance, despite its emotion regulation benefits, interpersonal dehumanisation inhibits considering the other person's mental state and truly connecting with them as a human being. This interpersonal dehumanisation might have detrimental consequences for doctor-patient interactions beyond treatment, including misdiagnosis and patient difficulty during recovery; alternative emotion regulation strategies might prevent burnout without harming the doctor-patient relationship. It would be helpful to explore whether empathy training programs and emotional regulation strategies can mitigate interpersonal dehumanisation among medical professionals facing emotionally demanding situations. Similarly, in workplace settings, interpersonal dehumanisation might influence employees' well-being because an instrumental view of an employee does not consider the full human being and their various needs. Organisational policies that reduce employee objectification—such as fostering empathetic leadership—could be tested as countermeasures to dehumanising practices. Investigating how interpersonal dehumanisation interacts with other psychological processes (such as

perceptions of inequity or cultural norms) could support the design of culturally relevant interventions.

Conceptually, future research should delve deeper into how contextual factors and social goals shape interpersonal dehumanisation. For example, what features of a context make it a candidate context for interpersonal dehumanisation? Which social goals promote interpersonal dehumanisation? Research that answers such questions would benefit from more integrated measures that combine self-reports, observed behaviours, and neurophysiological data.

Ultimately, research on dehumanisation holds transformative potential to inform public policies and social practices. Tackling dehumanisation through an interdisciplinary lens that combines insights from psychology, neuroscience, sociology, and philosophy will deepen understanding of the phenomenon and enable the development of concrete solutions to foster more humane and ethical interactions across diverse spheres of everyday life.

Figure captions

Figure 1. Functions of interpersonal dehumanization. Interpersonal dehumanization serves different functions related to past, present and future needs.

Figure 2. Brain networks associated with interpersonal dehumanization. Social cognition (red), empathy (yellow) and moral decision-making (blue) brain networks. Areas involved in both social cognition and moral decision-making are shown in purple; areas involved in both empathy and moral decision-making are shown in green. DLPFC: dorsolateral prefrontal cortex; IFG: inferior frontal gyrus; IPL: interior parietal lobe; ATL: anterior temporal pole; STS: superior temporal sulcus; TPJ: temporal-parietal junction; MPFC: medial prefrontal cortex; ACC: anterior cingulate cortex; PCC: posterior cingulate cortex.

Box 1: Operationalising dehumanisation

Dehumanisation has been operationalised in many ways that broadly fall into two categories: perception and language. Perceptual approaches ask participants to consider whether an image is a human being or not. Perceptual paradigms involve morphing images of humans with images of non-human entities such as dolls. Participants are shown the morphed images moving from human to non-human and respond when they think they have seen a human (or vice versa)[116]. Researchers also show the ascent of man stereotype that depicts silhouettes of monkeys, great apes, and humans on a continuum of evolved status. Participants then rate social groups by placing them on this continuum. Groups placed closer to the non-human image suggest greater dehumanisation[113]. In another paradigm noise is added to visual images of people or objects, and then the noise is gradually reduced to reveal the image. Participants respond when they can see the image. Identifying images with more noise suggests the image is more salient. For instance, dehumanisation is inferred when people identify an ape image more quickly when it is preceded by a dehumanised versus non-dehumanised target[117].

Other perceptual approaches rely on brain imaging or physiological measures collected while people view images of people and objects. In one such study, participants looked at images of different people while researchers collected functional magnetic resonance imaging data focussed on the social cognition brain network—a reliable network of brain regions engaged when people consider the minds of other people[71-75]. Less engagement of this network suggests less engagement of mental state inferences and a less human perception of the image[7,8]. Researchers have also used the amplitude of the N170 evoked response potential—an electroencephalography measure evoked by human faces—as an index of dehumanisation. The size of the amplitude difference between upright and inverted target images is smaller for objectified relative to non-objectified targets[80,81]. Other physiological measures include the use of facial electromyography to measure facial mimicry when viewing human and dehumanised targets displaying emotional expressions. Because people spontaneously mimic others' facial expressions[118], less spontaneous mimicry suggests more dehumanisation[119].

Language approaches can be further divided into attributional or descriptive approaches. Attributional approaches rely on self-reported attributions of various mental states, such as complex emotions (for example, remorse), stereotypical human dimensions including things considered typical or uniquely human (for example, civility), mental states (for example, agency), mind perception (agency and experience), or person perception dimensions (warmth and competence). The less these traits and mental states are attributed to a target, the more that target is dehumanised[2-3].

Descriptive approaches rely on participants to spontaneously generate descriptions of a target[10]. The words used are then coded, focussing on verbs, in particular those that can only be used if the mental state of the target is considered (for example, 'sit' describes a basic behaviour of a human of non-human target and does not require a mental state inference to the target, whereas 'relax' is a mental state verb that can be used to describe sitting behaviour and its use suggests something about the target's mental state.). Less use of words associated with considering a target's mental state suggests more dehumanisation[10].

Box 2. Additional neural correlates

Research on the human stereotype (the traits people associate with being human that differentiate humanised and dehumanised targets) suggests that several brain regions correlate with social judgments relevant to dehumanisation, including familiarity, similarity, warmth, competence, how human a target is perceived to be, and subjective reports of the ease of inferring the person's mental state[10]. These brain regions comprise nodes in the executive function, learning and reward, and interoception brain networks. The engagement of these broader networks suggests that spontaneous regulation of a mental state inference—interpersonal dehumanisation—might serve broader psychological functions.

Evidence for a broader psychological impact of interpersonal dehumanisation comes from research in legal decision-making contexts. Logical processing brain networks were less active when participants considered information to determine the responsibility and punishment of defendants described by their biology versus defendants described by their personality[11]. Additionally, the estimated value of players purchased (and dehumanised) by participants in a labour market context could not be estimated from activity in learning and decision-making brain networks necessary to estimate player value, but by the decrease in social cognition brain activation, an index of dehumanisation. Value estimates for players who were not purchased (and not dehumanised) could be predicted by activity in valuation brain networks[9]. Conversely, giving participants information about a partner's previous behaviour that suggests something about moral character was associated with less activity in learning and decision-making networks relative to partners without moral character information when deciding whether to trust that partner in an economic game[120]. These results suggest that mental state inferences influence logical reasoning, valuation, learning and decision-making.

Studies on the impact of sexual objectification on oddball effects indexed by the P300 event-related potential[116] implicate executive function brain systems in interpersonal dehumanisation. The oddball effect is assessed in a change detection task where the same stimulus is presented sequentially, occasionally interrupted by a different stimulus—the oddball. This oddball produces a P300 evoked potential brain response, which correlates with the degree of difference between the oddball and the repeated stimulus[121]. Participants were presented with either a doll image (the target with an image filter added to appear like a doll) in a sequence of target presentations, or the target in a sequence of doll images to drive a P300 response to the oddball. There was a reduced P300 response to minimally clothed oddball targets in a doll image sequence, and to oddball doll image targets in a minimally clothed target sequence, suggesting less executive function and attentional engagement for objectified targets.

Box 3: Clarifying jargon

The terms perspective-taking, mentalising, mind perception, mental state inference, cognitive empathy, mind attribution, and social cognition are used interchangeably in the literature with inconsistent meanings. Here we clarify our use of these terms to avoid misconceptions due to alternative definitions.

Perspective-taking requires considering another person's thoughts and feelings. Perspective-taking is a kind of mental state inference. Some researchers refer to this as cognitive empathy[122]. The three terms mentalising, mental state inference, and cognitive empathy are synonyms. Failure to engage a mental state inference when considering another person defines interpersonal dehumanisation responses. Dehumanisation in psychology is often measured as an attribution of mental qualities, which requires perspective-taking, but this is not the definition of interpersonal dehumanisation. Mind attribution or mind perception (also synonyms) require identifying that an agent has a mind, and might result from a mental state inference, but can also arise from other sources of information. Cognitive empathy is the precursor to affective empathy and captures the understanding of the other person's internal state. This is also a mental state inference.

Box 4. Dehumanisation and other moral emotions

Inferring a target's mental state provides information about the target's emotional state, triggering the emotional resonance characteristic of empathy. Dehumanisation might also regulate other moral emotions, such as guilt shame, pride, elevation (an emotion elicited by witnessing actual or imagined virtuous acts of remarkable moral goodness[123]), and awe. Partial evidence in support of this hypothesis comes from the intergroup literature. For example, guilt partially mediates the relationship between dehumanisation and support for reparations to an outgroup previously wronged by an ingroup[124], and self-objectification mediates the experience of shame[125]. Given that people affiliated with a competitive ingroup often describe themselves and their competitors in dehumanising language[126] (for example, describing a beloved teammate as 'an animal') and there is a tendency to 'bask in reflected glory' when one's sports team is successful[127], it is plausible that dehumanisation might regulate pride. Finally, moral outrage tends to co-occur with dehumanisation in propaganda during human atrocities, consistent with the co-occurrence of contempt for and dehumanisation of extreme societal outgroups[9]. Further research is needed to determine whether the impact of dehumanisation on these moral emotions also occurs during interpersonal interactions.

References

1. Opotow, S. Moral exclusion and injustice: An introduction. *J. of Soc. Issues*, **46**, 1-20 (1990).
2. Leyens, J. P., et al. Psychological essentialism and the differential attribution of uniquely human emotions to ingroups and outgroups. *Euro. J. Soc. Psych.*, **31**, 395-411 (2001).
3. Leyens, J. P., et al. Emotional prejudice, essentialism, and nationalism: The 2002 Tajfel Lecture. *Euro. J. Soc. Psych.*, **33**, 703-717 (2003).
4. Rodin, M. J. Who is memorable to whom: A study of cognitive disregard. *Soc. Cogn.*, **5**, 144-165 (1987).
5. Todorov, A., & Uleman, J. S. Spontaneous trait inferences are bound to actors' faces: Evidence from a false recognition paradigm. *J. Pers. Soc. Psych.,* **83**, 1051–1065 (2002).
6. Cikara, M., Eberhardt, J. L., & Fiske, S. T. From agents to objects: Sexist attitudes and neural responses to sexualized targets. *J. Cogn. Neuro.*, **23**, 540-551 (2011).
7. Harris, L. T., & Fiske, S. T. Dehumanizing the lowest of the low: Neuroimaging responses to extreme out-groups. *Psych. Sci.*, **17**, 847-853 (2006).
8. Harris, L. T., & Fiske, S. T. Social groups that elicit disgust are differentially processed in mPFC. *Soc. Cogn. Affect. Neuro.*, **2**, 45-51. (2007).
9. Harris, L. T., Lee, V. K., Capestany, B. H., & Cohen, A. O. Assigning economic value to people results in dehumanization brain response. *J. Neuro. Psych. Econ.,* **7**, 151–163 (2014).

10. Harris, L. T. & Fiske, S. T. Dehumanized perception: A psychological means to facilitate atrocities, torture, and genocide? *Zeit. Psych. / J. Psych.*, **219**, 175–181 (2011).
11. Capestany, B. H. & Harris, L. T., Disgust and biological descriptions bias logical reasoning during legal decision-making. *Soc. Neuro.*, **9**, 265-277 (2014).
12. Harris, L.T. Invisible mind: Flexible social cognition and dehumanization. (MIT Press, 2017).
13. Kteily, N. S., & Bruneau, E. Darker demons of our nature: The need to (re) focus attention on blatant forms of dehumanization. *Curr. Dir. Psych. Sci.*, **26**, 487-494 (2017).
14. Kteily, N. S., & Landry, A. P. Dehumanization: Trends, insights, and challenges. *Tr. Cog. Sci.*, **26**, 222-240 (2022).
15. Bastian, B., & Haslam, N. Experiencing dehumanization: Cognitive and emotional effects of everyday dehumanization. *Bas. App. Soc. Psych.*, **33**, 295-303 (2011).
16. Smith, D. L. Less than human: Why we demean, enslave, and exterminate others. St. Martin's Press (2011).
17. Fiske, A. P., & Rai, T. S. Virtuous violence: Hurting and killing to create, sustain, end, and honor social relationships. Cambridge Uni. Press (2014).
18. Lang, J. The limited importance of dehumanization in collective violence. *Curr. Opin. Psych.*, **35**, 17-20 (2020).
19. Rai, T. S., & Fiske, A. P. Beyond harm, intention, and dyads: Relationship regulation, virtuous violence, and metarelational morality. *Psych. Inq.*, **23**, 189-193 (2012).

20. Castano, E., & Giner-Sorolla, R. Not quite human: Infrahumanization in response to collective responsibility for intergroup killing. *J. Pers. Soc. Psych.,* **90**, 804–818 (2006).
21. Kouchaki, M., Dobson, K. S., Waytz, A., & Kteily, N. S. The link between self-dehumanization and immoral behavior. *Psych. Sci.*, **29**, 1234-1246 (2018).
22. Tang, S., & Harris, L. T. Construing a transgression as a moral or a value violation impacts other versus self-dehumanisation. *Rev. Int. Psych. Soc.*, **28**, 95-123 (2015).
23. Bandura, A. Moral disengagement in the perpetration of inhumanities. *Pers. Soc. Psych. Rev.*, **3**, 193–209 (1999).
24. Pizzirani B., Karantzas G. C., Mullins E. R. The development and validation of a dehumanization measure within romantic relationships. *Front. Psych.*, **10**, 2754 (2019).
25. Karantzas, G. C., Simpson, J. A., & Pizzirani, B. The loss of humanness in close relationships: An interpersonal model of dehumanization. *Curr. Opin. Psych.,* **46**, 101317 (2022).
26. Morera, M. D., Quiles, M. N., & Gonzalez-Mendez, R. Integrating dehumanization and attachment in the prediction of teen dating violence perpetration. *J. Interpers. Viol.,* **37,** NP1939-NP1962 (2020).
27. Bevens, C. L., & Loughnan, S. Insights into men's sexual aggression toward women: Dehumanization and objectification. *Sex Rol.: J. Res.,* **81**, 713-730 (2019).
28. Manne, K. Humanism: A critique. *Social Theory and Practice*, **42**, 389-415 (2016).

29. Statman, D. Rejecting the Objectification Hypothesis. *Rev. Phil. Psych.*, **15**, 113-130 (2024).

30. Brandt, M. J., & Reyna, C. The chain of being: A hierarchy of morality. *Persp. Psych. Sci.*, **6**, 428–446 (2011).

31. Bastian, B., Jetten, J., & Haslam, N. An interpersonal perspective on dehumanization. In *Humanness and dehumanization* (eds. Bain, P. G., Vaes, J. & Leyens, J.P.) 205–224 (Psychology Press, 2014).

32. Vaes, J., & Bastian, B. Tethered humanity: Humanizing self and others in response to interpersonal harm. *Euro. J. Soc. Psych.,* **51***,* 377–392 (2021).

33. Vaes, J., Orabona, N., Muslu, Ö., & Piazza, M. The tethered humanity hypothesis among victims of interpersonal harm: The role of apologies, forgiveness, and the relation between self-, other-, and meta-perceptions of humanity. *Group Proc. Intergr. Rel.*, **25**, 2021-2041 (2022).

34. Fredrickson, B. L., & Roberts, T. A. Objectification theory: Toward understanding women's lived experiences and mental health risks. *Psych. Women Quart.*, **21**, 173-206 (1997).

35. Brockdorf, A. N., et al. Associations between sexual objectification and bystander efficacy: The mediating role of barriers to bystander intervention. *Viol. Vict.,* **38***,* 148–164 (2023).

36. Vasquez, E. A., Ball, L., Loughnan, S., & Pina, A. The object of my aggression: Sexual objectification increases physical aggression toward women. *Aggres. Beh.*, **44**, 5-17 (2018).

37. Baldissarri, C., & Fourie, M. M. Dehumanizing organizations: insidious effects of having one's human integrity denied at work. *Curr. Opin. Behav. Sci.*, **49**, 101244 (2023).

38. Hoogendoorn, C. J., & Rodríguez, N. D. Rethinking dehumanization, empathy, and burnout in healthcare contexts. *Curr. Opin. Behav. Sci.*, **52**, 101285 (2023).

39. Baldissarri, C., Andrighetto, L., & Volpato, C. The longstanding view of workers as objects: antecedents and consequences of working objectification. *Euro. Rev. Soc. Psych.,* **33***,* 81–130 (2021).

40. Nussbaum, M. Objectification. *Phil. Pub. Aff.*, **24**, 249–291 (1995).

41. Gruenfeld, D. H., Inesi, M. E., Magee, J. C., & Galinsky, A. D. Power and the objectification of social targets. *J. Pers. Soc. Psych.*, **95**, 111-127 (2008).

42. Schaerer, M., Du Plessis, C., Yap, A. J., & Thau, S. Low power individuals in social power research: A quantitative review, theoretical framework, and empirical test. *Org. Behav. Hum. Dec. Proc.,* **149***,* 73–96 (2018).

43. Landau, M. J., Sullivan, D., Keefer, L. A., Rothschild, Z. K., & Osman, M. R. Subjectivity uncertainty theory of objectification: Compensating for uncertainty about how to positively relate to others by downplaying their subjective attributes. *J. Exp. Soc. Psych.*, **48**, 1234-1246 (2012).

44. Kim, J. Y., Campbell, T. H., Shepherd, S., & Kay, A. C. Understanding contemporary forms of exploitation: Attributions of passion serve to legitimize the poor treatment of workers. *J. Pers. Soc. Psych.,* **118**, 121–148 (2020).

45. Stanley, M. L., Neck, C. B., & Neck, C. P. Loyal workers are selectively and ironically targeted for exploitation. *J. Exp. Soc. Psych.,* **106***,* 1–11 (2023).

46. Ferguson, B. & Veneziani, R. Exploitation. *Econ. Phil.*, **34**, 291-294 (2018).

47. Zwolinski, M.; Ferguson, B, & Wertheimer, A. Exploitation. *Stan. Encyc. Phil.* (2022).

48. Belmi, P., & Schroeder, J. Human “resources”? Objectification at work. *J. Pers. Soc. Psych.,* **120***,* 384–417 (2021).

49. Lee, M. K., Fruchter, N & Dabbish, L. Making decisions from a distance: the impact of technological mediation on riskiness and dehumanization. *Proc. ACM CSCW, **15***, 1576–1589 (2015).

50. Teng, F., Chen, Z., Poon, K.-T., Zhang, D., & Jiang, Y. Money and relationships: When and why thinking about money leads people to approach others. *Org. Behav. Hum. Dec. Proc.,* **137***,* 58–70 (2016).

51. Wang, X., & Krumhuber, E. G. The love of money results in objectification. *Brit. J. Soc. Psych.*, **56**, 354-372 (2017).

52. Gervais, S. J., Sáez, G., Riemer, A. R., & Klein, O. The Social Interaction Model of Objectification: A process model of goal-based objectifying exchanges between men and women. *Brit. J. Soc. Psych.,* **59***,* 248–283 (2020).

53. Pecini, C., et al. Sexual objectification: advancements and avenues for future research. *Curr. Opin. Behav. Sci.,* **50***, 101261* (2023).

54. Vaes, J., Paladino, P. & Puvia, E. Are sexualized women complete human beings? Why men and women dehumanize sexually objectified women. *Euro. J. Soc. Psych.*, **41**, 774-785 (2011).

55. Haque, O. S., & Waytz, A. Dehumanization in Medicine: Causes, Solutions, and Functions. *Perspect. Psych. Sci.,* **7***,* 176–186 (2012).

56. Capozza, D., Falvo, R., Boin, J., & Colledani, D. Dehumanization in medical contexts: An expanding research field. *TPM-Test., Psychomet., Meth. App. Psych.,* **23**, 545–559 (2016).

57. Gleichgerrcht, E., & Decety, J. Empathy in clinical practice: How individual dispositions, gender, and experience moderate empathic concern, burnout, and emotional distress in physicians. *PLoS ONE,* **8**, e61526 (2013).

58. Gillespie, M., & Peterson, B. L. Helping novice nurses make effective clinical decisions: the situated clinical decision-making framework. *Nurs. Edu. Perspec.*, **30**, 164–170 (2009).

59. Delgado, N., Bonache, H., Betancort, M., Morera, Y., & Harris, L.T. Understanding the Links between Inferring Mental States, Empathy, and Burnout in Medical Contexts. *Healthcare*, **9**, 158 (2021).

60. Cameron, C.D. Motivating empathy: Three methodological recommendations for mapping empathy. *Soc. Pers. Psych. Comp.*, **12**, p.e12418 (2018).

61. Cameron, C. D., Harris, L. T., & Payne, B. K. The emotional cost of humanity: Anticipated exhaustion motivates dehumanization of stigmatized targets. *Soc. Psych. Pers. Sci.*, **7**, 105-112 (2016).

62. Tangney, J. P., Stuewig, J., & Mashek, D. J. Moral emotions and moral behavior. *Ann. Rev. Psych.*, **58**, 345-372 (2007).

63. Bloom, P. Against empathy: The case for rational compassion. Random House (2017).

64. Ferguson, A. M., Cameron, C. D., & Inzlicht, M. When does empathy feel good?. *Curr. Opin. Beh. Sci.*, **39**, 125-129 (2021).

65. Cameron, C. D., Hutcherson, C. A., Ferguson, A. M., Scheffer, J. A., Hadjiandreou, E., & Inzlicht, M. Empathy is hard work: People choose to avoid empathy because of its cognitive costs. *J. Exp. Psych.: Gen.,* **148**, 962–976 (2019).
66. Darley, J. M., & Latane, B. Bystander intervention in emergencies: Diffusion of responsibility. *J. Pers. Soc. Psych.,* **8**, 377–383 (1968).
67. Neuberg, S. L., & Fiske, S. T. Motivational influences on impression formation: Outcome dependency, accuracy-driven attention, and individuating processes. *J. Pers. Soc. Psych.,* **53**, 431–444 (1987).
68. Shaw, L. L., Batson, C. D., & Todd, R. M. Empathy avoidance: Forestalling feeling for another in order to escape the motivational consequences. *J. Pers. Soc. Psych.,* **67**, 879–887 (1994).
69. Cameron, C. D., & Payne, B. K. Escaping affect: How motivated emotion regulation creates insensitivity to mass suffering. *J. Pers. Soc. Psych.,* **100**, 1–15 (2011).
70. Small, D. A., Loewenstein, G., & Slovic, P. Sympathy and callousness: The impact of deliberative thought on donations to identifiable and statistical victims. In (ed Slovic, P.) *The Feeling of Risk,* 51-68, (Routledge, 2013).
71. Amodio, D. M., & Frith, C. D. Meeting of minds: The medial frontal cortex and social cognition. *Nat. Rev. Neuro.,* **7**, 268–277 (2006).
72. Frith, C. D., & Frith, U. (2012). Mechanisms of social cognition. *Annual Review of Psychology*, *63*(1), 287-313.
73. Gallagher, H. L., Jack, A. I., Roepstorff, A., & Frith, C. D. Imaging the intentional stance in a competitive game. *Neuroimage*, **16**, 814-821 (2002).

74. Mars, R.B., et al. On the relationship between the “default mode network” and the “social brain”. *Front. Hum. Neuro.*, **6**, 189 (2012).

75. Van Overwalle F. Social cognition and the brain: a meta-analysis. *Hum. Brain Map.,* **30***,* 829–858 (2009).

76. Poldrack, R. A. Can cognitive processes be inferred from neuroimaging data?. *TICS*, **10**, 59-63. (2006).

77. Hutzler, F. Reverse inference is not a fallacy per se: Cognitive processes can be inferred from functional imaging data. *Neuroimage*, **84**, 1061-1069. (2014).

78. Mathiak, K. & Weber, R., Toward brain correlates of natural behavior: fMRI during violent video games. *Hum. Brain Map.*, **27**, 948-956 (2006).

79. Glick, P., & Fiske, S. T. An ambivalent alliance: Hostile and benevolent sexism as complementary justifications for gender inequality. *Am. Psych.*, **56**, 109-118 (2001).

80. Bernard, P., et al. The neural correlates of cognitive objectification: An ERP study on the body inversion effect associated with sexualized bodies. *Soc. Psych. Pers. Sci.*, **9**, 550-559 (2018).

81. Bernard, P., et al. Revealing clothing does not make the object: ERP evidences that cognitive objectification is driven by posture suggestiveness, not by revealing clothing. *Pers. Soc. Psych. Bull.*, **45**, 16-36 (2019).

82. Beyer, F., Münte, T.F., Erdmann, C. & Krämer, U.M., Emotional reactivity to threat modulates activity in mentalizing network during aggression. *Soc. Cog. Aff. Neuro.*, **9**, 1552-1560 (2014).

83. Kanske, P. The social mind: Disentangling affective and cognitive routes to understanding others. *Interdisc. Sci. Rev.,* **43***,* 115-124 (2018).

84. Maliske, L. Z., Schurz, M., & Kanske, P. Interactions within the social brain: Co-activation and connectivity among networks enabling empathy and Theory of Mind. *Neuro. Biobeh. Rev.,* **147***,* 105080 (2023).

85. Zaki, J. & Ochsner, K. The neuroscience of empathy: progress, pitfalls, and promise. Nat. Neuro., **15**, 675–680 (2012).

86. Decety, J., Norman, G. J., Berntson, G. G., & Cacioppo, J. T. A neurobehavioral evolutionary perspective on the mechanisms underlying empathy. *Prog. Neurobio.,* **98***,* 38-48 (2012).

87. Decety, J., Smith, K. E., Norman, G. J., & Halpern, J. A social neuroscience perspective on clinical empathy. *World Psychi.*, **13**, 233–237 (2014).

88. Avenanti, A., Paluello, I. M., Bufalari, I., & Aglioti, S. M. Stimulus-driven modulation of motor-evoked potentials during observation of others' pain. *NeuroImage*, **32**, 316-324 (2006).

89. Jackson, P. L., Rainville, P., & Decety, J. To what extent do we share the pain of others? Insight from the neural bases of pain empathy. *Pain*, **125**, 5-9 (2006).

90. Marsh, A. A. The neuroscience of empathy. *Curr. Op. Beh. Sci.,* **19***,* 110–115 (2018).

91. Singer, T., et al. Empathy for pain involves the affective but not sensory components of pain. *Sci.*, **303**, 1157–1162 (2004).

92. Decety, J., Yang, C. Y., & Cheng, Y. Physicians down-regulate their pain empathy response: an event-related brain potential study. *NeuroImage,* **50***,* 1676–1682 (2010).

93. Cheng, Y., Chen, C., & Decety, J. How situational context impacts empathic responses and brain activation patterns. *Front. Beh. Neuro.,* **11***,* 165 (2017).

94. Cogoni, C., Monachesi, B., Mazza, V., Grecucci, A., & Vaes, J. Neural dynamics of vicarious physical pain processing reflect impaired empathy toward sexually objectified versus non-sexually objectified women. *Psychophys.* **60***, e14400* (2023).

95. Vaes, J., Meconi, F., Sessa, P., & Olechowski, M. Minimal humanity cues induce neural empathic reactions towards non-human entities. *Neuropsychologia,* **89***,* 132–140 (2016).

96. Zaki J. Empathy: A motivated account. *Psych. Bull.,* **140***,* 1608–1647 (2014).

97. Simon, J. C., & Gutsell, J. N. Recognizing humanity: dehumanization predicts neural mirroring and empathic accuracy in face-to-face interactions. *Soc. Cog. Aff. Neuro.,* **16***,* 463–473 (2021).

98. Decety, J., & Jackson, P. L. The functional architecture of human empathy. *Beh. Cog. Neuro. Rev.,* **3***,* 71–100 (2004).

99. Shamay-Tsoory S. G. The neural bases for empathy. *Neuroscientist,* **17***,* 18–24 (2011).

100. Zaki, J., & Ochsner, K. Neural sources of empathy: An evolving story. (In eds. Baron-Cohen, S., Tager-Flusberg, H. & Lombardo, M. V.), *Understanding other minds: Perspectives from developmental social neuroscience*, 214–232 (Oxford University Press, 2013).

101. Kanske, P., Böckler, A., Trautwein, F. M., & 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,* **122***,* 6–19 (2015).

102. FeldmanHall, O., & Mobbs, D. A neural network for moral decision-making. (In eds. Toga, A. W. & Lieberman, M. D.), *Brain Mapping: An Encyclopedic Reference*. (Elsevier, 2015).

103. Camerer, C., & Mobbs, D. Differences in behavior and brain activity during hypothetical and real choices. *Tr. Cog. Sci.*, **21**, 46-56 (2017).

104. Kang, M. J., Rangel, A., Camus, M., & Camerer, C. F. Hypothetical and real choice differentially activate common valuation areas. *J. Neuro.*, **31**, 461-468 (2011).

105. Harris, L. T. The neuroscience of human and artificial intelligence presence. *Ann. Rev. Psych.*, **75**, 433-466 (2024).

106. Lee, V. K., & Harris, L. T. How social cognition can inform social decision making. *Front. Neuro.*, **7**, 259 (2013).

107. Bai, H., Euh, H., Federico, C. M., & Borgida, E. Thou shalt not kill, unless it is not a human: Target dehumanization may influence decision difficulty and response patterns for moral dilemmas. *Soc. Cog.*, **39**, 657-686 (2021).

108. Greene, J. D., Sommerville, R. B., Nystrom, L. E., Darley, J. M., & Cohen, J. D. An fMRI investigation of emotional engagement in moral judgment. *Sci.*, **293**, 2105-2108 (2001).

109. Foot, P. The problem of abortion and the doctrine of double effect 5-15. (Oxford, 1967).

110. Cikara, M., Farnsworth, R. A., Harris, L. T., & Fiske, S. T. On the wrong side of the trolley track: Neural correlates of relative social valuation. *Soc. Cog. Aff. Neuro.*, **5**, 404-413 (2010).

111. Carter, C. S., Botvinick, M. M., & Cohen, J. D. The contribution of the anterior cingulate cortex to executive processes in cognition. *Rev. Neuro.*, **10**, 49-58 (1999).

112. Majdandžić, J., et al. The human factor: Behavioral and neural correlates of humanized perception in moral decision making. PLoS One, **7**, e47698 (2012).

113. Craig, A. D. Significance of the insula for the evolution of human awareness of feelings from the body. *Annals NYAS*, **1225**, 72-82 (2011).

114. Lee, V.K. & Harris, L.T., Sticking with the nice guy: Trait warmth information impairs learning and modulates person perception brain network activity. *Cog. Aff. Beh. Neuro*, **14**, 14.20-1437 (2014).

115. Gray, K., Young, L., & Waytz, A. Mind Perception Is the Essence of Morality. *Psych. Inq.*, **23**, 101–124 (2012).

116. Vaes, J., Cristoforetti, G., Ruzzante, D., Cogoni, C., & Mazza, V. Assessing neural responses towards objectified human targets and objects to identify processes of sexual objectification that go beyond the metaphor. *Sci. Rep.*, **9**, 6699 (2019).

117. Goff, P. A., Eberhardt, J. L., Williams, M. J., & Jackson, M. C. (2008). Not yet human: implicit knowledge, historical dehumanization, and contemporary consequences. *Journal of personality and social psychology*, *94*(2), 292-306.

118. van Dillen, L. F., Harris, L. T., van Dijk, W. W., & Rotteveel, M. (2015). Looking with different eyes: The psychological meaning of categorisation goals moderates facial reactivity to facial expressions. *Cognition and Emotion*, *29*(8), 1382-1400.

119. Ruzzante, D., & Vaes, J. (2024). Impaired Emotional Mimicry Responses Towards Objectified Women. *Journal of Nonverbal Behavior*, 1-25.

120. Delgado, M. R., Frank, R. H., & Phelps, E. A. Perceptions of moral character modulate the neural systems of reward during the trust game. *Nat. Neuro.*, **8**, 1611-1618 (2005).

121. van Dinteren, R., Arns, M., Jongsma, M. L., & Kessels, R. P. (2014). P300 development across the lifespan: a systematic review and meta-analysis. *PloS one*, *9*(2), e87347.

122. Davis, M. H. The effects of dispositional empathy on emotional reactions and helping: A multidimensional approach. *J. Pers.*, **51**, 167-184 (1983).

123. Algoe, S. B., & Haidt, J. (2009). Witnessing excellence in action: The 'other-praising'emotions of elevation, gratitude, and admiration. *The journal of positive psychology*, *4*(2), 105-127.

124. Zebel, S., Zimmermann, A., Tendayi Viki, G., & Doosje, B. Dehumanization and guilt as distinct but related predictors of support for reparation policies. *Pol. Psych.*, **29**, 193-219 (2008).

125. Noll, S. M., & Fredrickson, B. L. A mediational model linking self-objectification, body shame, and disordered eating. *Psych. Women Quart.*, **22**, 623-636 (1998).

126. Over, H. Seven challenges for the dehumanization hypothesis. *Perspect. Psych. Sci.*, **16**, 3-13 (2021).

127. Cialdini, R. B., Borden, R. J., Thorne, A., Walker, M. R., Freeman, S., & Sloan, L. R. Basking in reflected glory: Three (football) field studies. *J. Pers. Soc. Psych.*, **34**, 366-375 (1976).