

Running Head: DEHUMANISED HOMELESS

The Neuroscience Underlying Dehumanised Perception of People who are Homeless

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Chapter Abstract: People who have no permanent accommodation suffer stigmatisation stemming from a dehumanised perception—a failure to consider the minds of such people. Dehumanised perception promotes both active and passive harm towards people who are homeless (rough sleepers), including social avoidance and physical attacks. In addition, people who are homeless also elicit disgust and contempt, and are held responsible for their situation. Social neuroscience research over the last two decades has elucidated the brain mechanisms underlying consideration of other minds, and documented reduced engagement of this mechanism when people encounter people who are homeless. This chapter describes this research, along with subsequent research that explores why such perceptions occur, and how they may be ameliorated. It also explores other brain mechanisms related to dehumanised perception and disgust, explaining how they interact with situational factors and personality variables to promote or inhibit dehumanisation of people who are homeless.

Chapter Keywords: brain mechanism, dehumanisation, disgust, homeless people, mentalising

The Neuroscience Underlying Dehumanised Perception of People who are Homeless

How does the actual, imagined, or implied presence of others influence an individual's thoughts, feelings, and behaviour? This fundamental question in social psychology¹ motivates a fundamental question in social cognition: how does the presence of others influence the way we perceive them? Dennett posited the intentional stance as an answer: we treat other people as if they had beliefs, desires and other mental states, even if our official position is that they do not possess such mental states.² Therefore, this indicates that the default mode of our perception of other people is that we infer they have mental states (a mind), and we make inferences about their mind (i.e. mentalising).³ However, over the previous couple of decades, social neuroscience and psychology research has documented a failure to adopt the intentional stance—a dehumanised perception—when people perceive certain social groups such as people who are homeless (rough sleepers).⁴

People experiencing homelessness are perceived as the lowest of the low social group, and elicit extreme emotional prejudice in our society.⁵ Dehumanised perception describes a failure to engage the default cognitive-affective psychological processes typically engaged

¹ Gordon W. Allport, *The Nature of Prejudice* (Reading, Ma, Addison-Wesley, 1979, first published 1954).

² Kwame Anthony Appiah, *Thinking It Through: An Introduction to Contemporary Philosophy* (Oxford, Oxford University Press, 2003); Daniel Clement Dennett, *The Intentional Stance* (Cambridge, Mass, MIT Press, 1989); Daniel Clement Dennett, and Karel Lambert, *The Philosophical Lexicon* (Location, Daniel Dennett, 1987).

³ Victoria Lee, and Lasana T Harris, "How Social Cognition Can Inform Social Decision Making", *Frontiers in Neuroscience*, 7 (2013), 259; Jacques-Philippe Leyens, Brezo Cortes, Stéphanie Demoulin, John F Dovidio, Susan T Fiske, Ruth Gaunt, Maria-Paola Paladino, Armando Rodriguez-Perez, Ramon Rodriguez-Torres, and Jeroen Vaes, "Emotional Prejudice, Essentialism, and Nationalism the 2002 Tajfel Lecture", *European Journal of Social Psychology*, 33 (2003), 703-17.

⁴ Lasana T Harris and Susan T Fiske, "Social Neuroscience Evidence for Dehumanised Perception", *European Review of Social Psychology*, 20 (2009), 192-231.

⁵ Susan T Fiske, Amy JC Cuddy, Peter Glick, and Jun Xu, "A Model of (Often Mixed) Stereotype Content: Competence and Warmth Respectively Follow from Perceived Status and Competition", *Journal of Personality and Social Psychology*, 82 (2002), 878-902.

during person perception; it describes a failure to *mentalise* or consider another person's thoughts, beliefs, desires, and other mental states.⁶

Social psychologists have long studied dehumanisation as a biased perception with a cognitive or affective mechanism. This research has revealed that dehumanisation is an outcome of a cognitive bias that may be caused by a lack of familiarity⁷ and self-other similarity,⁸ preventing moral judgment.⁹ Moreover, dehumanization is accompanied by affective responses such as disgust and contempt that promote moral exclusion and extreme emotional prejudice towards low status people.¹⁰

Social neuroscience approaches to dehumanised perception have combined social psychological paradigms that explore person perception with brain imaging technology to gain a glimpse inside the 'black box' of psychological processes. This allows comparison of brain activity during dehumanised perception of another person, identifying brain indices of

⁶ Lasana T Harris and Susan T Fiske, 'Social Neuroscience Evidence for Dehumanised Perception'.

⁷ Andrew M Colman, David J Hargreaves, and Wladyslaw Sluckin, 'Preferences for Christian Names as a Function of Their Experienced Familiarity', *British Journal of Social Psychology*, 20 (1981), 3-5; Andrew M Colman, Wladyslaw Sluckin, and David J Hargreaves, 'The Effect of Familiarity on Preferences for Surnames', *British Journal of Psychology*, 72 (1981), 363-69; John T Jones, Brett W Pelham, Matthew C Mirenberg, and John J Hetts, 'Name Letter Preferences Are Not Merely Mere Exposure: Implicit Egotism as Self-Regulation', *Journal of Experimental Social Psychology*, 38 (2002), 170-77; AH Maslow, 'The Influence of Familiarization on Preference', *Journal of Experimental Psychology*, 21 (1937), 162-80; Susan Saegert, Walter Swap, and Robert B Zajonc, 'Exposure, Context, and Interpersonal Attraction', *Journal of Personality and Social Psychology*, 25 (1973), 234-42; Linda Stinson, and William Ickes, 'Empathic Accuracy in the Interactions of Male Friends Versus Male Strangers', *Journal of Personality and Social Psychology*, 62 (1992), 787-97; Robert B Zajonc, 'Attitudinal Effects of Mere Exposure', *Journal of Personality and Social Psychology*, 9 (1968), 1-27.

⁸ Thomas G O'Connor, and Nicola Hirsch, 'Intra-Individual Differences and Relationship-Specificity of Mentalising in Early Adolescence', *Social Development*, 8 (1999), 256-74.

⁹ Albert Bandura, 'Selective Activation and Disengagement of Moral Control', *Journal of Social Issues*, 46 (1990), 27-46; Albert Bandura, Bill Underwood, and Michael E Fromson, 'Disinhibition of Aggression through Diffusion of Responsibility and Dehumanization of Victims', *Journal of Research in Personality*, 9 (1975), 253-69; Daniel Bar-Tal, 'Delegitimization: The Extreme Case of Stereotyping and Prejudice', in *Stereotyping and Prejudice* (New York, Springer, 1989), pp. 169-82; Daniel Bar-Tal, 'Causes and Consequences of Delegitimization: Models of Conflict and Ethnocentrism', *Journal of Social Issues*, 46 (1990), 65-81; Jonathan Haidt, Paul Rozin, Clark McCauley, and Sumio Imada, 'Body, Psyche, and Culture: The Relationship between Disgust and Morality', *Psychology and Developing Societies*, 9 (1997), 107-31; Susan Opatow, 'Moral Exclusion and Injustice: An Introduction', *Journal of Social Issues*, 46 (1990), 1-20.

¹⁰ Amy JC Cuddy, Susan T Fiske, and Peter Glick, 'The Bias Map: Behaviors from Intergroup Affect and Stereotypes', *Journal of Personality and Social Psychology*, 92 (2007), 631-48; Susan T Fiske, Amy JC Cuddy, and Peter Glick, 'Emotions up and Down: Intergroup Emotions Result from Status and Competition', *From Prejudice to Intergroup Emotions: Differentiated Reactions to Social Groups*, (New York, Psychology Press, 2002), pp.247-64; Leyens *et al.* 'Emotional Prejudice, Essentialism, and Nationalism the 2002 Tajfel Lecture'.

dehumanised perception, gaining insight beyond self-report data. By discussing social neuroscience evidence, this article aims to explain the reasons for and explore potential solutions to dehumanised perception of homeless people.

A social neuroscience approach

Social neuroscience is an interdisciplinary research approach that investigates the biology underlying social phenomena such as dehumanisation. The social neuroscience approach consists of both cognitive and affective neuroscience methods (i.e. brain imaging, brain stimulation, and other psychophysiological measures), and social psychological paradigms (e.g. vignettes, economic games, social-cognitive and affective tasks) that allow for coverage of multiple levels of analysis (i.e. social level, cognitive-affective level, and the level of the brain), and requires advanced technologies (e.g. functional magnetic resonance imaging (fMRI), electroencephalography (EEG) & transcranial magnetic stimulation (TMS)). The current section introduces and incorporates research methods, analysis levels, and technologies in social neuroscience, and illustrates how the research logic in this field informs the neuroscience underlying dehumanised perception towards homeless people.

Brain activations and hypothesis testing.

With the increasing accessibility of fMRI at the turn of the millennium, social neuroscientists were able to correlate psychological processes with specific brain regions. This brain mapping method makes social neuroscience one of the main approaches to studying social behaviour.¹¹ In a typical brain imaging study, experimenters track changes in brain activity by noninvasively observing blood oxygen-level dependent (BOLD) signals obtained during

¹¹ David M Amodio, 'Can Neuroscience Advance Social Psychological Theory? Social Neuroscience for the Behavioral Social Psychologist', *Social Cognition*, 28 (2010), 695-716; Alexander Todorov, Lasana T Harris, and Susan T Fiske, 'Toward Socially Inspired Social Neuroscience', *Brain Research*, 1079 (2006), 76-85.

an experimental task. Although fMRI is not best for detecting millisecond temporal differences in psychological processes due to its poor temporal resolution, fMRI can effectively identify brain regions with high fidelity spatial resolution, allowing a correlation between psychological constructs and brain activation patterns (often distributed across brain regions, or restricted to a single brain region). This spatial resolution benefit allows researchers to localise brain activity to brain structures and brain networks (brain circuits). Importantly, the primary goal in brain imaging studies is to identify brain indices of psychological process (e.g. mentalising, disgust) that relate to relevant behavioural measures of a psychological phenomenon (e.g. answers on a questionnaire or speeded responses in a game).

In addition, fMRI and other neuroscience technology allow social neuroscientists to not only identify brain indices of psychological phenomena, but to also test the relationship between two psychological constructs by comparing their brain activation patterns.¹² Such comparisons show similarities between processes that were theorised to be different, and differences between processes theorised as similar. The social neuroscience underlying dehumanised perception towards people affected by homelessness takes advantage of these benefits to create a scientific narrative.

Multiple levels of analysis

Social neuroscience is thus an interdisciplinary scientific discipline. Accordingly, most social neuroscience studies addresses social psychology questions on at least three levels, including social context and social motives that impact human behaviour (social level), the information processing mechanisms underlying the social-level phenomenon (cognitive level), and the

¹² Amodio, 'Can Neuroscience Advance Social Psychological Theory? Social Neuroscience for the Behavioral Social Psychologist'

brain activations that give rise to cognitive level processes (brain level).¹³ However, social phenomena also involve affective responses that drive behaviour; for instance, dehumanised perception towards homeless people involves disgust.¹⁴

Accordingly, the brain level is valuable but is just one of the levels needed to understand social phenomena. For instance, dehumanised perception towards a homeless person in a train station may be a cognitive bias that results from low levels of familiarity with such people, a cognitive bias that results from an expected moral violation attributed to such people, or an emotional prejudice response that results from cultural stereotypes towards the lowest of low social group.¹⁵ To pinpoint the specific psychological process underlying this phenomenon, social neuroscience can isolate the underlying psychological processes and then identify relevant brain networks.¹⁶ The knowledge from psychological and brain evidence could be incorporated with other philosophical, economic, legal, and political sources to inform practical advice to policy makers.¹⁷

Different routes to dehumanisation

Dehumanised perception results from the absence of a core component of person perception: social cognition. Person perception is a dual process, involving processing of a physical form

¹³ Matthew D Lieberman, 'Social Cognitive Neuroscience: A Review of Core Processes', *Annual Review of Psychology*, 58 (2007), 259-89; Kevin N Ochsner, 'Social Cognitive Neuroscience: Historical Development, Core Principles, and Future Promise', *Social Psychology: Handbook of Basic Principles*, (2007), 39-66; Kevin N Ochsner, and Matthew D Lieberman, 'The Emergence of Social Cognitive Neuroscience', *American Psychologist*, 56 (2001), 717-34; Todorov *et al.* 'Toward Socially Inspired Social Neuroscience'.

¹⁴ Lasana T Harris, and Susan T Fiske, 'Dehumanizing the Lowest of the Low: Neuroimaging Responses to Extreme Outgroup', *Psychological Science*, 17 (2006), 847-53.

¹⁵ Harris, and Fiske, 'Social Neuroscience Evidence for Dehumanised Perception'.

¹⁶ John T Cacioppo, Gary G Berntson, and Jean Decety, 'Social Neuroscience and Its Relationship to Social Psychology', *Social Cognition*, 28 (2010), 675-85.

¹⁷ Lasana T Harris, 'Dignity Takings and Dehumanization: A Social Neuroscience Perspective', *Chicago-Kent Law Review*, 92 (2017), 725-42; Harris, and Fiske, 'Social Neuroscience Evidence for Dehumanised Perception'; Lasana T Harris, Victoria K Lee, Beatrice H Capestany, and Alexandra O Cohen, 'Assigning Economic Value to People Results in Dehumanization Brain Response', *Journal of Neuroscience, Psychology, and Economics*, 7 (2014), 151-63; Lasana T. Harris, 'Why Economic, Health, Legal, and Immigration Policy Should Consider Dehumanization', *Policy Insights from the Behavioral and Brain Sciences*, 1 (2014), 144-50.

with sensory mechanisms (what someone looks, sounds, and even smells like) and an inference of the person's mind. This latter social cognition identifies a target as a human being,¹⁸ since we tend not to engage social cognition to non-human targets unless we are anthropomorphising. Social cognition also makes relevant the person's thoughts and feelings. Accordingly, dehumanised perception towards people affected by homelessness occurs when people spontaneously fail to engage social cognition to such people.¹⁹ This section discusses different routes—cognitive and affective mechanisms—towards dehumanised perceptions of people who are homeless.

Similarity and familiarity

We may dehumanise other people because they are dissimilar (in physical appearance, beliefs, culture, customs, and behaviour), or because they are unfamiliar. Both these characteristics of the person depend on self-perception and social comparison, specifically self-other comparisons. Stated differently, although all human beings have a mind and possess humankind's unique characteristics - language, intelligence, and complex emotions (i.e. thoughts and feelings),²⁰ the only mind that we actually can experience is our own. Therefore, we infer whether other agents have minds by comparing their behaviour to our own. If they behave similarly to us or if they are familiar to us, we spontaneously engage social cognition because our mind can serve as a proxy for their mind. Conversely, if other agents behave in strange way, we may fail to engage social cognition since the strange behaviour suggests that the agents do not have minds like ours.²¹ Therefore, self-other similarity and familiarity are two important constructs that differentiate person perception and dehumanised perception.

¹⁸ Dolores Morera, Ma Quiles, Ana Correa, Naira Delgado, and Jacques-Philippe Leyens, 'Perception of Mind and Dehumanization: Human, Animal, or Machine?', *International Journal of Psychology*, 53 (2016).

¹⁹ Lasana T Harris, and Susan T Fiske, 'Dehumanized Perception', *Zeitschrift für Psychologie* (2015), 175-81.

²⁰ Leyens *et al.* 'Emotional Prejudice, Essentialism, and Nationalism the 2002 Tajfel Lecture'.

²¹ Harris and Fiske, 'Social Neuroscience Evidence for Dehumanised Perception'; Lasana T Harris, *Invisible Mind: Flexible Social Cognition and Dehumanization* (Cambridge, Mass, MIT Press, 2017).

Dehumanising immoral agents

Dehumanising immoral agents reduces them to “monsters” or vile villains not quite human.²² Considering another’s mind makes moral rules that govern human behaviour relevant. If perceivers fail to consider the mind of another because of their immoral behaviour, it suggests the other does not abide by human moral rules, therefore is not quite human.²³ This provides an explanatory motive for immoral behaviour post-hoc. Therefore, even though we identify other agents as intentional agents, we may add a moral filter during person perception. If the agent’s behaviour fits our moral standard, we consider their mind. On the other hand, if we perceive the agent’s behaviour as “wrong”, the moral filter would stop us granting humanness to the agent.²⁴ Therefore, moral judgment is a factor that differentiates person perception and dehumanised perception.

Dehumanising outgroup members

The above two routes to dehumanisation interact to create dehumanisation of outgroup members; moral filters do not result from personal experience but social norms,²⁵ and people tend to perceive outgroups as acting outside of societal norms²⁶ and operating beyond prescribed boundaries of moral rules and values. This tendency is called moral exclusion²⁷ and is a strong predictor of dehumanised perception.

²² Dana Lori Chalmers, ‘Villains in Nazi Theatre and Paratheatre’, *Villains, Heroes or Victims?* (2010), 81-7; Kurt Gray, Liane Young, and Adam Waytz, ‘Mind Perception Is the Essence of Morality’, *Psychological Inquiry*, 23 (2012), 101-24; Federica Sustersic, ‘Excluded from the World of Men: Dehumanisation of Victims and Perpetrators in the Genocidal Context’, *Doctoral Dissertation* (2015).

²³ Haidt *et al.* ‘Body, Psyche, and Culture: The Relationship between Disgust and Morality’; Nick Haslam, Brock Bastian, Simon Laham, and Stephen Loughnan, ‘Humanness, Dehumanization, and Moral Psychology’, *Herzliya Series on Personality and Social Psychology. The Social Psychology of Morality: Exploring the Causes of Good and Evil*, (2012), 203-18; Marc Hauser, *Moral Minds: How Nature Designed Our Universal Sense of Right and Wrong* (New York, Ecco/HarperCollins Publishers, 2006).

²⁴ Haslam *et al.* ‘Humanness, Dehumanization, and Moral Psychology’.

²⁵ Bar-Tal, ‘Causes and Consequences of Delegitimization: Models of Conflict and Ethnocentrism’.

²⁶ Bar-Tal, ‘Delegitimization: The Extreme Case of Stereotyping and Prejudice’.

²⁷ Ervin Staub, *The Roots of Evil: The Origins of Genocide and Other Group Violence* (Cambridge, Cambridge University Press, 1989).

Without moral exclusion, people still perceive less humanity in outgroup members than that ingroup members.²⁸ The theory of outgroup infrahumanisation suggests that a self-other comparison explains the phenomenon; people spontaneously deny outgroup members typical human-nature characteristics – such as having complex emotions.²⁹ Human beings experience basic emotions such as joy and sadness, emotions that non-human animals experience. Complex emotions, such as regret or pride, are social emotions that only people can feel³⁰ since they require mentalising; objects and animals are not attributed complex emotions unless they are anthropomorphised.³¹ People attribute fewer complex emotions to outgroups than ingroups. In addition to perceived self-other similarity,³² spontaneous categorisation³³ has been identified as a potential mechanism for infrahumanisation.

Dehumanising the lowest of low: societal outcasts

Although we propose cognitive processes above, emotion is also relevant to dehumanised perception. Dehumanised perception of the lowest of low social groups (for example, people affected by homelessness, or addicted to drugs) illustrates its link to disgust.³⁴ Not all emotional biases or prejudices are equal, and prejudice is more than simple dislike of an individual due to their social group categorisation. The stereotype content model (SCM)

²⁸ Shalom H Schwartz, and Naomi Struch, 'Values, Stereotypes, and Intergroup Antagonism', in *Stereotyping and Prejudice* (New York, Springer, 1989), pp. 151-67.

²⁹ Nick Haslam, and Steve Loughnan, 'Dehumanization and Infrahumanization', *Annual Review of Psychology*, 65 (2014), 399-423.

³⁰ Leyens *et al.* 'Emotional Prejudice, Essentialism, and Nationalism the 2002 Tajfel Lecture'; Jacques-Philippe Leyens, Armando Rodriguez-Perez, Ramon Rodriguez-Torres, Ruth Gaunt, Maria-Paola Paladino, Jeroen Vaes, and Stéphanie Demoulin, 'Psychological Essentialism and the Differential Attribution of Uniquely Human Emotions to Ingroups and Outgroups', *European Journal of Social Psychology*, 31 (2001), 395-411.

³¹ Harris, 'Dignity Takings and Dehumanization: A Social Neuroscience Perspective'; Harris, *Invisible Mind: Flexible Social Cognition and Dehumanization*

³² Jeroen Vaes, Maria Paola Paladino, Luigi Castelli, Jacques-Philippe Leyens, and Anna Giovanazzi, 'On the Behavioral Consequences of Infrahumanization: The Implicit Role of Uniquely Human Emotions in Intergroup Relations', *Journal of Personality and Social Psychology*, 85 (2003), 1016-34.

³³ Ramón Rodríguez-Torres, Jacques Philippe Leyens, Armando Rodríguez Pérez, Verónica Betancor Rodríguez, María N Quiles del Castillo, Stéphanie Demoulin, and Brezo Cortés, 'The Lay Distinction between Primary and Secondary Emotions: A Spontaneous Categorization?', *International Journal of Psychology*, 40 (2005), 100-07.

³⁴ Lasana T Harris, and Susan T Fiske, 'Dehumanized Perception', *Zeitschrift für Psychologie* (2015), 175-81.

helps us identify different types of prejudice.³⁵ A social group's status within society and their interdependence with the societal ingroup locates outgroups into a two-dimensional *warmth X competence* space with four quadrants describing different prejudice responses to different outgroups. Warmth captures perceived good or ill intentions, including trustworthiness, morality and sociability. Competence captures perceived ability to enact good or ill intentions. Mixed ascriptions of warmth and competence flavour different prejudices as distinctive emotions³⁶ and behavioural tendencies towards different social groups.³⁷

High warmth and high competence groups elicit positive ingroup responses of pride and admiration and receive help and association from others. Groups in the low warmth and high competence quadrant experience ambivalent outcomes; their high status elicits envy and jealousy and they receive both active harm and passive association. Another ambivalent cluster is the high warmth and low competence outgroups who elicit pity and sympathy, and receive both active help and passive harm or neglect.

However, homeless people are usually two standard deviations below the low competence -low warmth quadrant that elicits disgust and contempt, emotions usually reserved for non-human animals, food, body excrement and death,³⁸ and they receive both active and passive harm. Beyond rough sleepers, immigrants, people addicted to drugs and people living in poverty also reside in the low-low quadrant, and their negative outcomes are perceived to result from their violation of moral boundaries.³⁹ Disgust is also linked to moral

³⁵ Fiske *et al.* 'A Model of (Often Mixed) Stereotype Content: Competence and Warmth Respectively Follow from Perceived Status and Competition'.

³⁶ Fiske, Cuddy, and Glick, 'Emotions up and Down: Intergroup Emotions Result from Status and Competition'.

³⁷ Cuddy, Fiske, and Glick, 'The Bias Map: Behaviors from Intergroup Affect and Stereotypes'.

³⁸ Haidt *et al.* 'Body, Psyche, and Culture: The Relationship between Disgust and Morality'.

³⁹ Opatow, 'Moral Exclusion and Injustice: An Introduction'.

violation,⁴⁰ therefore disgust is an important affective correlate underlying dehumanised perception towards people with experience of homelessness.

Brain correlates of dehumanisation-related psychological constructs

Dehumanised perception can be viewed as a condition where social information (i.e. other agents' thoughts and feelings) is not perceived and processed successfully because social cognition is not engaged. Here, we use brain activity as an index for when people have engaged social cognition. Therefore, we start this section by introducing brain regions involved in social cognition, and then, introduce potential dehumanisation elicitors in a greater depth.

Social brain

Social cognition includes aspects of mentalising, person perception, social learning, and moral judgment and empathy. (see Figure 1⁴¹) Mentalising and person perception brain regions include the medial prefrontal cortex (MPFC) and pregenual cingulate (pACC) amygdala, insula, superior temporal sulcus (STS), fusiform gyrus of temporal cortex (FFA), precuneus, posterior cingulate, and right temporal-parietal junction (rTPJ). Moral judgment involves the orbital (OFC) and MPFC, amygdala, insula, and striatum. Social learning includes the nucleus accumbens (NAC), caudate, putamen, and globus pallidum (GP). Empathy involves MPFC, posterior cingulate, bilateral angular gyri (AG), middle frontal gyrus, bilateral parietal lobes, and insula. Amygdala, MPFC, STS, precuneus, anterior cingulate cortex (ACC), and insula underlie moral judgment.

Mentalising

⁴⁰ Haidt *et al.* 'Body, Psyche, and Culture: The Relationship between Disgust and Morality'.

⁴¹ Harris and Fiske, 'Social Neuroscience Evidence for Dehumanised Perception'.

Mentalising involves thinking about a target's mind or inferring their mental states. Targets can be either non-human animals, moving objects, or human beings.⁴² Theory of mind⁴³ argues that we can predict others' behaviour by mentalising or taking the intentional stance.⁴⁴ To identify the brain correlates of mentalising, social neuroscientists often employ false belief tasks using moving objects, stories, or interactive games describing behaviours that require participants to think about other's mental states. The existing results consistently implicated the same brain regions, namely the STS, adjacent TPJ and the MPFC.⁴⁵

Familiarity

Familiarity with a social stimulus may differentiate person perception and dehumanised perception by moderating one's mentalising likelihood. The higher the level of familiarity, the greater the mentalising likelihood. In one experiment, a group of Chinese participants could infer the intention (positive, negative, or neutral) behind social gestures they were familiar with, but they were unable to identify the intention behind unfamiliar gestures. In addition, familiar gestures activated the MPFC while unfamiliar gestures activated the human putative mirror neuron system (pMNS).⁴⁶ Similarly, American mothers looking at their own children induced more MPFC activity than looking at familiar children, and looking at unfamiliar children induced even less MPFC activity than looking at familiar children.⁴⁷ Considering the importance of MPFC in mentalising, familiarity plays an important role in mentalising likelihood and dehumanised perception.

⁴² Fritz Heider, and Marianne Simmel, 'An Experimental Study of Apparent Behavior', *The American Journal of Psychology*, 57 (1944), 243-59.

⁴³ David Premack, and Guy Woodruff, 'Does the Chimpanzee Have a Theory of Mind?', *Behavioral and Brain Sciences*, 1 (1978), 515-26.

⁴⁴ Daniel Dennett, 'Intentional Systems Theory', *The Oxford Handbook of Philosophy of Mind* (Oxford, Oxford University Press, 2009), pp.339-50; Dennett, *The Intentional Stance*

⁴⁵ Chris D Frith, and Uta Frith, 'The Neural Basis of Mentalizing', *Neuron*, 50 (2006), 531-34; Uta Frith, and Chris Frith, 'The Biological Basis of Social Interaction', *Current Directions in Psychological Science*, 10 (2001), 151-55.

⁴⁶ Sook-Lei Liew, Shihui Han, and Lisa Aziz-Zadeh, 'Familiarity Modulates Mirror Neuron and Mentalizing Regions During Intention Understanding', *Human Brain Mapping*, 32 (2011), 1986-97.

⁴⁷ Ellen Leibenluft, M Ida Gobbin, Tara Harrison, and James V Haxby, 'Mothers' Neural Activation in Response to Pictures of Their Children and Other Children', *Biological Psychiatry*, 56 (2004), 225-32.

Additionally, the level of familiarity also affects mentalising accuracy. In unstructured social interactions, male undergraduate students were more accurate in inferring their male friends' thoughts and feelings than inferring male strangers'.⁴⁸ Second, the effect of familiarity on mentalising ability may be moderated by a familiarity-favourability. For instance, the familiarity with a Christian name,⁴⁹ a random surname,⁵⁰ or a fictitious pharmaceutical name⁵¹ positively correlated with people's level of preference towards the name. In other words, the more a participant was familiar with a name, the more that participants liked it. The familiarity-favourability relationship may explain the effect of familiarity on mentalising ability and dehumanised perception.

Self-other similarity

The MPFC engages during thinking about the self and self-related psychological processes such as reflecting on one's sense of self, (i.e. self-reflection)⁵²; making personality trait or current state judgments about the self (i.e. self-judgment), and reflecting on experiences and projecting the self into imagined futures (i.e. self-referential processing).⁵³ A meta-analysis of 107 neuroimaging studies shows a robust brain overlap in MPFC between mentalising the self and others,⁵⁴ suggesting that thinking about the self and mentalising others are two closely-related processes.

Moreover, the perceived level of similarity between oneself and another person may moderate mentalising that person. A higher perceived similarity between the participant and

⁴⁸ Stinson and Ickes, 'Empathic Accuracy in the Interactions of Male Friends Versus Male Strangers'

⁴⁹ Colman, Hargreaves, and Sluckin, 'Preferences for Christian Names as a Function of Their Experienced Familiarity'

⁵⁰ Colman, Sluckin, and Hargreaves, 'The Effect of Familiarity on Preferences for Surnames'

⁵¹ Jochim Hansen, and Michaela Wänke, 'Liking What's Familiar: The Importance of Unconscious Familiarity in the Mere-Exposure Effect', *Social Cognition*, 27 (2009), 161-82.

⁵² Sterling C Johnson, Leslie C Baxter, Lana S Wilder, James G Pipe, Joseph E Heiserman, and George P Prigatano, 'Neural Correlates of Self-Reflection', *Brain*, 125 (2002), 1808-14.

⁵³ William M Kelley, C Neil Macrae, Carrie L Wyland, Selin Caglar, Souheil Inati, and Todd F Heatherton, 'Finding the Self? An Event-Related Fmri Study', *Journal of Cognitive Neuroscience*, 14 (2002), 785-94.

⁵⁴ Bryan T Denny, Hedy Kober, Tor D Wager, and Kevin N Ochsner, 'A Meta-Analysis of Functional Neuroimaging Studies of Self-and Other Judgments Reveals a Spatial Gradient for Mentalizing in Medial Prefrontal Cortex', *Journal of Cognitive Neuroscience*, 24 (2012), 1742-52.

another person resulted stronger MPFC activation when asking the participant to infer the person's satisfaction⁵⁵ or to rate the person's personality trait.⁵⁶ Therefore, the higher similarity of the self to others may increase the possibility of mentalising the other.

Social reward

Interacting with a person could be intrinsically rewarding since people perceive human beings positively by default.⁵⁷ This robust "person-positivity bias" is consistent with brain imaging evidence that shows social rewarding processing such as affective evaluating⁵⁸ and social information processing such as mentalising engages the same brain region – MPFC.⁵⁹ For instance, the MPFC is sensitive to immediate monetary reward from a person rather than from a computer.⁶⁰ Similarly, when choosing an online chat partner, a group of eight to 15-year-olds preferred chatting with peer partners than answering questions from fictional story characters. They also preferred to infer their partners choices than infer the next section of a story. These results support person-positivity biases since the brain and behavioural evidence show that peer interaction, even without mentalising tasks, activate MPFC, which suggested that peer interaction induces mentalising even without explicit intentions to mentalise.⁶¹

⁵⁵ Jason P Mitchell, Mahzarin R Banaji, and C Neil MacRae, 'The Link between Social Cognition and Self-Referential Thought in the Medial Prefrontal Cortex', *Journal of Cognitive Neuroscience*, 17 (2005), 1306-15.

⁵⁶ Roland G Benoit, Sam J Gilbert, Emmanuelle Volle, and Paul W Burgess, 'When I Think About Me and Simulate You: Medial Rostral Prefrontal Cortex and Self-Referential Processes', *Neuroimage*, 50 (2010), 1340-49.

⁵⁷ Harris and Fiske, 'Social Neuroscience Evidence for Dehumanised Perception'.

⁵⁸ Wouter Van Den Bos, Samuel M McClure, Lasana T Harris, Susan T Fiske, and Jonathan D Cohen, 'Dissociating Affective Evaluation and Social Cognitive Processes in the Ventral Medial Prefrontal Cortex', *Cognitive, Affective, & Behavioral Neuroscience*, 7 (2007), 337-46.

⁵⁹ Christoph W Korn, Kristin Prehn, Soyoung Q Park, Henrik Walter, and Hauke R Heekeren, 'Positively Biased Processing of Self-Relevant Social Feedback', *Journal of Neuroscience*, 32 (2012), 16832-44; Sören Krach, Frieder M Paulus, Maren Bodden, and Tilo Kircher, 'The Rewarding Nature of Social Interactions', *Frontiers in Behavioral Neuroscience*, 4 (2010), 22; Van Den Bos *et al.* 'Dissociating Affective Evaluation and Social Cognitive Processes in the Ventral Medial Prefrontal Cortex'; Henrik Walter, Birgit Abler, Angela Ciaramidaro, and Susanne Erk, 'Motivating Forces of Human Actions: Neuroimaging Reward and Social Interaction', *Special Issue: 2nd Conference on NeuroEconomics ConNEcs 2004 May 25-27, 2004, Munster, Germany.*, 67 (2005), 368-81.

⁶⁰ Samuel M McClure, David I Laibson, George Loewenstein, and Jonathan D Cohen, 'Separate Neural Systems Value Immediate and Delayed Monetary Rewards', *Science*, 306 (2004), 503-07.

⁶¹ Diana Alkire, Daniel Levitas, Katherine Rice Warnell, and Elizabeth Redcay, 'Social Interaction Recruits Mentalizing and Reward Systems in Middle Childhood', *Human Brain Mapping*, 39 (2018), 3928-42.

Stated differently, interacting with peers spontaneously induces mentalising, and is rewarding.

However, the reward from a social interaction may be moderated by the emotion that the interacting partner elicits. Participants viewed pictures of people and objects that elicit different emotions including pride, envy, pity, and disgust, and the MPFC activity to disgusting pictures of people was significantly less than activity to other emotions and objects.⁶² Therefore, disgust may reduce mentalising and the perceived reward of a social interaction.

Moral judgment

Moral exclusion happens when an individual behaves beyond the boundary of moral values and rules. This negative moral judgment will make people evaluate the individual as unessential and underserving, in addition to dehumanising this individual.⁶³ People do not grant humanness to moral violators since people view morality as a mandatory requirement of human beings.⁶⁴ However, perceivers may have different moral boundaries about human behaviour and individual judgments of the moral relativity of behaviour. A more affective-based moral system in the brain includes MPFC, posterior cingulate, and bilateral angular gyri. A more cognitive-based moral system in the brain includes the middle frontal gyrus and bilateral parietal lobes. Affective appraisals may be more dominant in moral judgement.⁶⁵ Since moral violators often elicit disgust,⁶⁶ we also include the insula and striatum in the brain network of moral judgment.

⁶² Lasana T Harris, Samuel M McClure, Wouter Van Den Bos, Jonathan D Cohen, and Susan T Fiske, 'Regions of the MpfC Differentially Tuned to Social and Nonsocial Affective Evaluation', *Cognitive, Affective, & Behavioral Neuroscience*, 7 (2007), 309-16.

⁶³ Opatow, 'Moral Exclusion and Injustice: An Introduction'.

⁶⁴ Hauser, *Moral Minds: How Nature Designed Our Universal Sense of Right and Wrong*.

⁶⁵ Joshua D Greene, R Brian Sommerville, Leigh E Nystrom, John M Darley, and Jonathan D Cohen, 'An Fmri Investigation of Emotional Engagement in Moral Judgment', *Science*, 293 (2001), 2105-08.

⁶⁶ Haidt *et al.* 'Body, Psyche, and Culture: The Relationship between Disgust and Morality'.

Brain activity to homeless people

Above we discussed relevant theories and brain networks underlying person perception and social cognition, and have proposed reduced engagement of the social cognition brain network (specifically mentalising and person perception brain networks) underlying dehumanised perception towards homelessness. Next, we highlight other brain regions and psychological processes that co-occur with perceptions of people affected by homelessness.

Increased insula and amygdala activity

Homeless people elicit activity in the insula and amygdala,⁶⁷ brain regions underlying disgust,⁶⁸ interoception,⁶⁹ fear conditioning,⁷⁰ implicit bias⁷¹ and emotion learning.⁷²

Experimenters provided a group of undergraduates several pictures of objects and people of different social groups, and asked them to select the emotion that best captured how the picture made them feel from four options: pride, envy, pity, and disgust. BOLD signals were recorded during this emotion labelling task, revealing left insula and right amygdala activity to homeless people.⁷³ Participants also labelled people who were homeless as disgusting.

Therefore, people affected by homelessness are the targets of both affective bias and dehumanised perception.

⁶⁷ Harris and Fiske, 'Dehumanizing the Lowest of the Low: Neuroimaging Responses to Extreme Outgroup'

⁶⁸ Andrew J Calder, 'Disgust Discussed', *Annals of Neurology* (2003), 427-28.

⁶⁹ Arthur D Craig, 'How Do You Feel? Interoception: The Sense of the Physiological Condition of the Body', *Nature Reviews Neuroscience*, 3 (2002), 655-66.

⁷⁰ Kevin B Baker, and Jeansok J Kim, 'Amygdalar Lateralization in Fear Conditioning: Evidence for Greater Involvement of the Right Amygdala', *Behavioral Neuroscience*, 118 (2004), 15-23.

⁷¹ Elizabeth A Phelps, Christopher J Cannistraci, and William A Cunningham, 'Intact Performance on an Indirect Measure of Race Bias Following Amygdala Damage', *Neuropsychologia*, 41 (2003), 203-08; Elizabeth A Phelps, Kevin J O'Connor, William A Cunningham, E Sumie Funayama, J Christopher Gatenby, John C Gore, and Mahzarin R Banaji, 'Performance on Indirect Measures of Race Evaluation Predicts Amygdala Activation', *Journal of Cognitive Neuroscience*, 12 (2000), 729-38.

⁷² John S Morris, Arne Öhman, and Raymond J Dolan, 'Conscious and Unconscious Emotional Learning in the Human Amygdala', *Nature*, 393 (1998), 467-70; Elizabeth A Phelps, 'Emotion and Cognition: Insights from Studies of the Human Amygdala', *Annual Review of Psychology*, 57 (2006), 27-53.

⁷³ Harris and Fiske, 'Dehumanizing the Lowest of the Low: Neuroimaging Responses to Extreme Outgroup'; Lasana T Harris, and Susan T Fiske, 'Social Groups That Elicit Disgust Are Differentially Processed in MpfC', *Social Cognitive and Affective Neuroscience*, 2 (2007), 45-51.

However, another fMRI study showed no difference of MPFC activation to disgusting human beings.⁷⁴ In this study, participants were asked to evaluate how much they liked a face, to identify the gender and to rate the disgust level of 160 headshot pictures. Half of the headshots are stigmatized (i.e. 'unattractive', overweight, transsexual, or pierced faces) while half of them were non-stigmatised. The results showed that participants liked non-stigmatised faces more than overweight and pierced faces, and mostly disliked transsexual and 'unattractive' faces. Stigmatised faces, especially 'unattractive' ones, elicited more disgust ratings than normal faces. However, this study replicated the emotional brain activation patterns: amygdala, insula, anterior cingulate, and lateral prefrontal cortex were involved in processing highly negative social stigmas. The amygdala showed greater activation with increasing negative evaluation. Since these brain regions are involved in responding to disgusting stimuli, this study supports that perceiving a stigma involves an affective component, but there is no brain evidence showing that participants engage the more cognitive dehumanised perception response to people who elicit disgust.

To explain the inconsistent social cognition brain network result between the studies above, consider the use of homelessness as social stimuli in one case but not the other. Moreover, follow-up studies with people who are homeless as disgust elicitors found that such rough sleepers are extremely negatively stigmatised⁷⁵ and all subsequent studies that included people experiencing homelessness as stimuli detected reduced MPFC activity.⁷⁶

⁷⁴ Anne C Krendl, C Neil Macrae, William M Kelley, Jonathan A Fugelsang, and Todd F Heatherton, 'The Good, the Bad, and the Ugly: An Fmri Investigation of the Functional Anatomic Correlates of Stigma', *Social Neuroscience*, 1 (2006), 5-15.

⁷⁵ Anne C Krendl, Todd F Heatherton, and Elizabeth A Kensinger, 'Aging Minds and Twisting Attitudes: An Fmri Investigation of Age Differences in Inhibiting Prejudice', *Psychology and Aging*, 24 (2009), 530-41.

⁷⁶ Anne C Krendl, Elizabeth A Kensinger, and Nalini Ambady, 'How Does the Brain Regulate Negative Bias to Stigma?', *Social Cognitive and Affective Neuroscience*, 7 (2012), 715-26; Anne C Krendl, Joseph M Moran, and Nalini Ambady, 'Does Context Matter in Evaluations of Stigmatized Individuals? An Fmri Study', *Social Cognitive and Affective Neuroscience*, 8 (2013), 602-08; Anne C Krendl, Joseph M Moran, and Nalini Ambady, 'Neural Correlates of Controllability', *Social Cognitive and Affective Neuroscience*, (2012).

This tags the affective disgust bias as separate from the cognitive dehumanise perception (failure to mentalise), and perhaps not necessary to drive the cognitive bias.

Another study supports this argument; participants were asked to 1) imagine a day in the life of a pictured person and 2) rate the warmth, competence, similarity, familiarity, ease of attributing a mind to the person, ease of inferring person's disposition, elicited empathy, person's responsibility for their situation, person's control over their situation, articulateness, intelligence, complex emotionality, self-awareness, person's ups and downs in life, and typical humanity on a 7-point Likert scale.⁷⁷ Compared to a picture of a female college student, male American firefighter, businesswoman, rich man, elderly man, and disabled woman, a female rough sleeper and a male drug addict received significantly lower ratings on human-perception dimensions, including typically human, warmth, similarity, familiarity, articulateness, intelligence, ease of getting inside their head, ease of inferring personality, and significantly more ups and downs in life. Brain activity revealed that perceived competence was associated with more activation in left posterior insula, a brain region associated with interoception⁷⁸ and the experience of physical pain.⁷⁹ Perceived warmth was associated with less activation in anterior insula, a brain region associated with disgust⁸⁰ and pain and punishment decisions,⁸¹ which suggests that increased insula activity may facilitate dehumanisation and subsequent active harm behaviour. Increased ease of getting into other

⁷⁷ Harris and Fiske, 'Dehumanized Perception'

⁷⁸ ST Francis, EF Kelly, R Bowtell, WJR Dunseath, SE Folger, and F McGlone, 'Fmri of the Responses to Vibratory Stimulation of Digit Tips', *Neuroimage*, 11 (2000), 188-202.

⁷⁹ JCW Brooks, and I Tracey, 'The Insula: A Multidimensional Integration Site for Pain', (LWW, 2007); Jonathan Brooks, and Irene Tracey, 'From Nociception to Pain Perception: Imaging the Spinal and Supraspinal Pathways', *Journal of Anatomy*, 207 (2005), 19-33; Tracy A Brooks, Brian T Hawkins, Jason D Huber, Richard D Egleton, and Thomas P Davis, 'Chronic Inflammatory Pain Leads to Increased Blood-Brain Barrier Permeability and Tight Junction Protein Alterations', *American Journal of Physiology-Heart and Circulatory Physiology*, 289 (2005), H738-H43.

⁸⁰ Calder, 'Disgust Discussed'

⁸¹ Ben Seymour, Tania Singer, and Ray Dolan, 'The Neurobiology of Punishment', *Nature Reviews Neuroscience*, 8 (2007), 300-11.

people's heads and increased similarity and familiarity were associated with bilateral STS, suggesting that these ratings rely on the social cognition brain network.

Social information processing moderates dehumanised perception

The current section presents brain evidence that the social context can reduce dehumanised perception by adjusting the salience of the person's mind and the perceiver's goals in that content, allowing access to information about the person's mind to facilitate a social interaction.

Valence

Valenced evaluation of social information is necessary in dehumanised perception.⁸² For instance, participants were asked to categorise a series of pictures of people and objects that elicited pride, envy, pity, and disgust, as positive or negative, or as people or objects. An area of the social cognition brain network, MPFC, was significantly reduced to people who are homeless during the valence, not the person categorisation task. This dissociation only held such rough sleepers, not disgusting objects. This suggests that explicit evaluations of people who are homeless as people reduce dehumanised perception, and valence evaluation (negative appraisals) likely lead to dehumanised perception.

Mental state information

Mental state information (also referred to as individuating information) also moderates the level of dehumanised perception.⁸³ In a study conducted in 2007, participants inferred vegetable preferences of pictured people, or guessed their age while we recorded their brain activity. Consistent with previous studies we found reduced social cognition brain network

⁸² Phelps, Cannistraci, and Cunningham, 'Intact Performance on an Indirect Measure of Race Bias Following Amygdala Damage'

⁸³ Harris, and Fiske, 'Social Groups That Elicit Disgust Are Differentially Processed in Mpfcc'

activity to people affected by homelessness and drug addiction in the age guessing condition, but we observed no such effect in the vegetable preferences condition. Since participants relied on mental state information in the latter, but social category information in the former conditions, mental state information could reduce dehumanised perception towards homeless people. Follow-up studies from other labs support this conclusion: Freeman and his colleagues found that forming a superficial impression based on a glimpse of one's face recruited amygdala, but forming individuating impressions based on the knowledge of a person recruits MPFC and requires mentalising.⁸⁴

Cognitive function and controllability

Aging and negative bias

Compared to young people, old people with impaired cognitive function are more likely to dislike and express explicit negative bias towards people experiencing homelessness.⁸⁵ One study asked 70-year-olds and 19-year-olds to identify the gender and likability of headshots of non-stigmatised and stigmatised people, including rough sleepers, amputation individuals, alcoholism and drug addiction sufferers. The likeability of people who are homeless was the lowest. Participants' trait cognitive function (including memory, arithmetic, logic, etc.) assessed using standard measures in the field showed a greater negative bias from low-functioning older people and young people.

Aging and emotion regulation

Given the role of disgust, emotion regulation could help reduce dehumanised perception towards people who are homeless. Specifically, regulating disgust and negative appraisals

⁸⁴ Freeman *et al.* 'The Neural Origins of Superficial and Individuated Judgments About Ingroup and Outgroup Members'

⁸⁵ Krendl, Heatherton, and Kensinger, 'Aging Minds and Twisting Attitudes: An Fmri Investigation of Age Differences in Inhibiting Prejudice'

could reduce implicit negative bias towards such rough sleepers. Typically, the lower the implicit bias, the greater the activity in MPFC.⁸⁶ However, this effect does not hold for older people with impaired cognitive function. After being instructed with a cognitive reappraisal strategy, older people with impaired cognitive function were less likely to change their attitudes towards people affected by homelessness compared with older people with preserved cognitive function. This may be because less cognitive function reduces older people's ability to regulate their negative biases towards people who are homeless.⁸⁷

The role of controllability

A consequence of this negative bias is that older people with low cognitive functioning attribute more control over their situation (controllability) to people who are homeless.⁸⁸

Perhaps low-functioning older people are more likely to engage cultural prejudices regarding homelessness, making them attribute more controllability to such people.⁸⁹

More interestingly, people who are homeless than have control over their situation may elicit more disgust yet are more likely to engage social cognition. In a series of experiments, participants saw pictures of rough sleepers with a short sentence describing the person and a scenario describing their controllability of the homelessness situation. An example of controllable scenarios is that a person who is homeless lost his money after he was caught embezzling. An example of uncontrollable scenarios is that a person who is homeless lost his job since his company downsized.⁹⁰ Behavioural evidence showed more pity and less disgust for people who were not responsible for their homelessness. Additionally, participants were

⁸⁶ Krendl, Kensinger, and Ambady, 'How Does the Brain Regulate Negative Bias to Stigma?'

⁸⁷ Anne C Krendl, 'Reduced Cognitive Capacity Impairs the Malleability of Older Adults' Negative Attitudes to Stigmatized Individuals', *Experimental Aging Research*, 44 (2018), 271-83.

⁸⁸ Anne C Krendl, and Elizabeth A Kensinger, 'Does Older Adults Cognitive Function Disrupt the Malleability of Their Attitudes toward Outgroup Members?: An Fmri Investigation', *Plos one*, 11 (2016). Anne C Krendl, and George Wolford, 'Cognitive Decline and Older Adults' Perception of Stigma Controllability', *Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 68 (2013), 333-36.

⁸⁹ Peter Hegarty, and Anne M Golden, 'Attributional Beliefs About the Controllability of Stigmatized Traits: Antecedents or Justifications of Prejudice? ', *Journal of Applied Social Psychology*, 38 (2008), 1023-44.

⁹⁰ Krendl, Moran, and Ambady, 'Does Context Matter in Evaluations of Stigmatized Individuals? An Fmri Study'; Krendl, Moran, and Ambady, 'Neural Correlates of Controllability'.

more willing to help the people who has no control over the homelessness situation (i.e. uncontrollable situation) than help the people who has the ability to change their homelessness situation (i.e. controllable situation). Brain evidence detected increased insula activity to people with controllable compared to uncontrollable situations, consistent with the disgust behavioural evidence. However, the insula has multi-faceted functionality,⁹¹ and insula activation could indicate empathy, an aversive response to the fact that people experiencing homelessness have no control over their situation, or a prosocial feeling towards them.⁹² Moreover, people with controllability elicited higher MPFC activity, suggesting that participants were more likely to mentalising people in controllable situations. This evidence indicates that attributing agency to people affected by homelessness could ameliorate dehumanised perception.

Invalid effect of empathy

Empathy is another emotional response that could decrease the level of dehumanised perception. However, no such effect was found with older people whose cognitive function was impaired or with people who engaged empathy avoidance. Specifically, participants completed person-rating and description matching tasks for extremely stigmatised individuals including rough sleepers. The higher the participants' trait cognitive function, the greater the differentiation in the amount of pity that older adults expressed towards homelessness as a function of perceived onset of their condition (e.g., controllability). This suggests that the greater the trait cognitive function, the greater the malleability of one's emotional experience in different contexts. Brain evidence showed more activity in left insula and left ACC in

⁹¹ Tal Yarkoni, Russell A Poldrack, Thomas E Nichols, David C Van Essen, and Tor D Wager, 'Large-Scale Automated Synthesis of Human Functional Neuroimaging Data', *Nature Methods*, 8 (2011), 665-70.

⁹² Mbemba Jabbi, Marte Swart, and Christian Keysers, 'Empathy for Positive and Negative Emotions in the Gustatory Cortex', *Neuroimage*, 34 (2007), 1744-53; Miiamaaria V Saarela, Yevhen Hlushchuk, Amanda C de C Williams, Martin Schürmann, Eija Kalso, and Riitta Hari, 'The Compassionate Brain: Humans Detect Intensity of Pain from Another's Face', *Cerebral cortex*, 17 (2007), 230-37; Tania Singer, and Claus Lamm, 'The Social Neuroscience of Empathy', *Annals of the New York Academy of Sciences*, 1156 (2009), 81-96; Tania Singer, Ben Seymour, John O'Doherty, Holger Kaube, Raymond J Dolan, and Chris D Frith, 'Empathy for Pain Involves the Affective but Not Sensory Components of Pain', *Science*, 303 (2004), 1157-62.

high-functioning older people than low-functioning older people, which suggests that older people with impaired cognitive function were less successful in using empathy to change their emotions and attitudes.⁹³

While older people with impaired cognitive function may fail to engage empathy and as a result dehumanise people who are homeless, younger people with unimpaired cognitive function may also dehumanise people affected by homelessness due to a motivational process of empathy avoidance. In one study, undergraduates had to choose to hear an appeal by a person who was homeless for help in either an objective, calm, and non-empathy-inducing way or an empathy-inducing way. Participants who were asked to make an initial commitment to spend 5-6 hours one-on-one with a rough sleeper, plus the possibility of further commitment later on chose to hear the empathy-inducing version less often than participants who made an initial commitment of 1 hour, no personal contact with people who were homeless, and no further commitment. The results indicated that empathy avoidance was likely to occur when people need to help a person who is homeless at an emotional or financial cost.⁹⁴ A follow up study supported this argument and suggested a role of anticipated emotional exhaustion. In the study, participants anticipated emotional exhaustion was manipulated before they saw either stigmatised (i.e. drug addict) or non-stigmatised (i.e. uncontrollable illness) people who are homeless. The participants' task was to describe a day in the life of the person, attribute a mind to the person (e.g. self-control, morality), and predict their tendency to experience compassion and distress. Participants attributed less mind to a stigmatised target when they anticipated high levels of emotional exhaustion.⁹⁵

⁹³ Krendl and Kensinger, 'Does Older Adults Cognitive Function Disrupt the Malleability of Their Attitudes toward Outgroup Members?: An Fmri Investigation'

⁹⁴ Laura L Shaw, C Daniel Batson, and R Matthew Todd, 'Empathy Avoidance: Forestalling Feeling for Another in Order to Escape the Motivational Consequences', *Journal of Personality and Social Psychology*, 67 (1994), 879-87.

⁹⁵ C Daryl Cameron, Lasana T Harris, and B Keith Payne, 'The Emotional Cost of Humanity: Anticipated Exhaustion Motivates Dehumanization of Stigmatized Targets', *Social Psychological and Personality Science*, 7 (2016), 105-12.

Based on a series of work from Krendl and colleagues, we conclude that age itself does not have an effect on dehumanised perception. However, cognitive function impairment has an interaction effect with age and makes older people less likely to regulate their emotions or use empathy. In addition, anticipated emotional exhaustion could also result in empathy avoidance and make people more likely to dehumanise people experiencing homelessness.⁹⁶ Introducing information about people's controllability over their homelessness situation may change perceivers' attitudes. In detail, more controllability in homelessness situation increases the perceiver's feeling of disgust but also increase mentalising.

Structural solutions

Reducing dehumanised perception of people who are homeless requires structural changes to ensure that social interactions are likely to build familiarity, similarity, encourage mentalising and the subsequent empathy, and finally encourage pro-social behaviour and policy change to end and prevent future homelessness. Below we briefly describe further empirical work consistent with these ideas.

Direct contact

Direct contact with people affected by homelessness has been proven to be an effective intervention to rehumanisation. In one study we took participants to soup kitchens where they had an interaction with rough sleepers. During the interaction, participants were required to answer eight questions about the person's preferences, providing them with mental state information about the person. Before and after the soup kitchen visit, we scanned participants brains while they viewed images of rough sleepers. Participants reported enjoying the

⁹⁶ Cameron, Harris, and Payne, 'The Emotional Cost of Humanity: Anticipated Exhaustion Motivates Dehumanization of Stigmatized Targets'

interaction more than watching a video of homelessness. We also found reduced insula and amygdala engagement post soup kitchen, suggesting a change in the emotional appraisal of people who were homeless.⁹⁷

Additional mental state information

Reading stories about people experiencing homelessness and their controllability can either increase the willingness to help or increase mentalising.⁹⁸ Moreover, listening to actors portray people's narratives about homelessness also alleviates dehumanised perception. Both sets of evidence suggest that providing information about the lived mental experiences of rough sleepers can encourage mentalising and change affective biases.

To conclude, we presented neuroscience evidence that suggested people who are homeless are not processed psychologically in the same manner as other people. Specifically, we argued that people fail to spontaneously engage social cognition to these people; this is a dehumanised perception. Moreover, people affected by homelessness elicit disgust. We demonstrated that the disgust response is somewhat independent from the cognitive dehumanised perception. We also argued that the perceived controllability of the person's situation can affect both dehumanised perception and subsequent empathy and pro-social behaviour. Increasing familiarity, similarity, and mental state information can also ameliorate dehumanised perception. Therefore, neuroscience provides us with insight that can be used to address the perception of homelessness and promote lasting cultural change.

⁹⁷ Peter A Kirk, Alexandra O Cohen, Walter Sinnott-Armstrong, and Lasana T Harris, 'Rehumanising the Homeless: Altered Bold Response Following Contact with an Extreme Outgroup', *bioRxiv* (2018).

⁹⁸ Hegarty and Golden, 'Attributional Beliefs About the Controllability of Stigmatized Traits: Antecedents or Justifications of Prejudice?'; Krendl, Moran, and Ambady, 'Neural Correlates of Controllability'; Krendl and Wolford, 'Cognitive Decline and Older Adults' Perception of Stigma Controllability'.