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Neurocognitive Mechanisms of Empathy in Conflict and Morally Challenging Contexts: A Scoping Review

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Abstract

Empathy in conflictual and morally challenging situations is not a simple response to others' suffering, but is shaped by affective resonance under conditions of perceived harm, responsibility and norm violation. Previous research has often examined these processes in isolation, for example in studies on empathy for pain or in moral dilemma paradigms. The aim of this scoping review is to systematically map the neurocognitive mechanisms of empathy in morally challenging contexts. In accordance with the PRISMA-ScR guidelines, 60 empirical studies using neuroimaging, EEG or psychophysiological methods were included. The findings were organised into five clusters: affective resonance, moral attribution and perspective taking, empathy in decision-making processes, top-down modulation, and dispositional and atypical profiles. Across all clusters, empathic distress was primarily associated with strong affective activation and salience processing, whereas compassion was linked to stronger engagement of cognitive and prefrontal networks. In morally challenging contexts, this imbalance reflects different patterns of integration between affective resonance and cognitive components of empathy.

I. Introduction

In current research, empathy is not understood as a uniform process, but rather as the interaction of several functionally different sub-mechanisms. Theoretical models distinguish between empathic resonance, empathic distress, and compassion [1], [2], [3]. This differentiation is particularly relevant in morally challenging situations in which individuals are confronted with suffering, norm violations, or responsibility for harm, as empathic distress can be associated with increased emotional stress and potentially dysfunctional decision-making processes, while compassion promotes prosocial behavior under stress [4]. Morally challenging contexts are not understood here as abstract ethical dilemmas, but rather as situations in which perceived harm, responsibility, or norm violations must be assessed amid emotional arousal, uncertainty and competing tendencies to act [5], [4]. The purpose of this scoping review is to systematically map the psychological and neurocognitive mechanisms of empathy in conflictual and morally challenging situations. The main research question is: Which psychological and neurocognitive mechanisms are proposed as the basis for empathy, empathic distress and compassion in conflictual and morally challenging situations? A scoping review was chosen because the existing literature is characterized by heterogeneity in terms of theoretical framing, experimental paradigms, and neurocognitive measurement methods [6]. Cluster labels were derived inductively from the dominant neurocognitive mechanism represented across studies rather than from specific experimental paradigms, methods, or outcome measures.

II. Methods and materials

This scoping review was conducted in accordance with the PRISMA-ScR guidelines in order to systematically collect and conceptually organize the existing literature on neurocognitive mechanisms of empathy in conflictual and morally challenging situations.

II.I. Eligibility criteria (PCC framework)

The inclusion criteria were defined using the Population Concept Context (PCC) scheme. Population: Studies involving adult participants (aged 18 years and older) were included. Both healthy samples and selected clinical groups (e.g., trauma-exposed individuals or forensic populations) were considered, provided that empathic processes were examined in morally relevant contexts. Concept: Studies that examined empathy or related constructs (empathic distress, compassion, emotional contagion, perspective taking) and explicitly addressed neurocognitive mechanisms were included. Neurocognitive mechanisms were considered across multiple levels of analysis, including neural activation patterns, neural structures, and psychophysiological correlates. Context: The following were taken into account: (A) real or realistic contexts of moral stress (e.g. trauma exposure, authority, responsibility for harm) and (B) experimental paradigms that model moral or conflict-related challenges (e.g. moral dilemmas, social exclusion tasks, third-party punishment). Exclusion criteria: Animal studies, purely behavioral studies without reference to neurocognitive mechanisms, pure intervention studies without a focus on mechanisms, non-English publications and duplicates were excluded.

II.II. Search strategy

The systematic literature search was conducted in the Pubmed, PsycINFO, Web of Science Core Collection and Scopus databases. The search covered publications from January 2000 up to the date of the final search (20 December 2025). The search strategy combined three thematic components: (1) empathy-related constructs (e.g. empathic distress, compassion), (2) neurocognitive mechanisms and their neural correlates (e.g. neural processes, brain networks, anterior insula, anterior cingulate cortex) as well as neurophysiological methods used to investigate them (e.g. EEG, fMRI) and (3) moral or conflict-related contexts (e.g.moral distress, moral injury, social exclusion, trauma exposure).

II.III. Study selection

First, titles and abstracts were screened based on the inclusion and exclusion criteria. In a second step, potentially relevant full texts were reviewed. The selection process is shown in a PRISMA flow diagram in Figure 1 [7].

II.IV. Data extraction and mapping

The following information was extracted for all included studies: authors and year of publication, study design, sample and context, empathy constructs examined, contexts, neurocognitive mechanisms, neural correlates, methodological approach, and key findings. The studies were then clustered thematically to identify recurring patterns in psychological constructs, neurocognitive mechanisms, neural correlates, and experimental paradigms. Studies were assigned to a primary cluster reflecting the dominant neurocognitive mechanism under investigation and, where applicable, to a secondary cluster capturing additional relevant mechanisms.

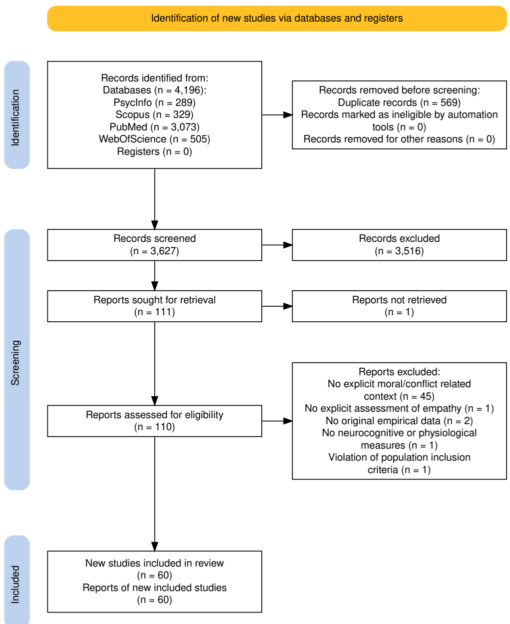

Figure 1: PRISMA flow diagram of the study selection process.

III. Results and discussion

III.I. Overview of identified clusters

The included studies were grouped into clusters reflecting different neurocognitive mechanisms of empathic processing.

III.II. Cluster A: Affective resonance

This cluster comprises studies in which empathy is primarily operationalized as an immediate affective response to the experiences of others. The focus is on paradigms of empathy for physical or social pain and their neural correlates in salience-related networks. These studies repeatedly show that observing pain or social rejection in other people triggers activation in the anterior insula and anterior cingulate cortex, i.e. in regions that are also recruited when experiencing pain oneself [8]. Furthermore, studies from conflict and authority contexts show that affective resonance towards victims can be attenuated by social conditions. Under conditions of obedience to authority, the neural response to the suffering of victims was reduced, both subjectively and in classical pain sensitivity networks [9].

III.III. Cluster B: Moral attribution & perspective-taking

This cluster brings together studies in which empathy is conceptualized not primarily as an affective response to suffering, but as a cognitively mediated process of perspective-taking and moral attribution. For example, an fMRI study on empathic attribution of guilt showed that neural responses to the victim's pain are primarily represented in the anterior insula and ACC, while the evaluation of the perpetrator's intention was systematically associated with activations in the temporoparietal junction (TPJ) and medial prefrontal cortex (mPFC) [10]. Studies on active conflict groups show that perspective-taking towards members of the opposing group is reduced and is accompanied by altered recruitment of mentalising networks [11]. Although individuals with psychopathic traits did not show deficits in the correct attribution of emotions, they did show reduced functional coupling between amygdala-based affect signals and mentalizing regions such as the TPJ and mPFC [12].

III.IV. Cluster C: Empathy in moral decision-making

This cluster comprises studies in which empathy is directly embedded in moral decision-making processes, such as dilemmas, fairness judgments, or decisions about harm and help. Earlier fMRI studies on moral dilemmas showed that personal-emotional conflicts are associated with increased activity in affect-related networks (including the insula, amygdala, and medial prefrontal cortex), while utilitarian decisions are more strongly associated with prefrontal control networks [5]. An fMRI study with separate evaluation modes for emotional aversion, benefit calculation and overall judgment showed that the amygdala encodes emotional rejection of harmful actions, while the ventromedial prefrontal cortex is specifically recruited when emotional and utilitarian information must be integrated [13]. In social decision-making situations involving authority, empathic responses to victims can weaken antisocial conformity and are associated with stronger neural responses to pain[14].

III.V. Cluster D: Top-down moral modulation of empathy

This cluster comprises studies showing that empathic responding is not solely driven by perceived suffering but is influenced by moral evaluations and social attributions such as guilt or responsibility attribution [15]. Here, top-down modulation means that empathic responding is shaped by these moral cues rather than by bottom-up reactions to others' pain alone. Top-down modulation is also evident in moral evaluation and sanction contexts.

III.VI. Cluster E: Dispositions & atypical profiles

This cluster comprises studies in which empathic processing in morally relevant situations is not primarily influenced by situational stimuli, but rather by stable dispositional characteristics or clinically atypical profiles. Empathy appears here less as a universal reaction and more as a process shaped by personality structure and neural integration patterns [16], [17]. Moral judgment remains functionally intact, but is organized differently in neurocognitive terms. While cognitive empathy remains largely intact, there are significant changes in emotional empathy components [17]. These patterns suggest that in morally challenging situations, affective resonance and cognitive components of empathy are integrated differently across individuals. This differentiation helps explain why empathic responding in morally challenging situations can shift towards empathic distress rather than compassion across individuals [17].

III.VII. Cross-cluster synthesis: Affective and cognitive components of empathy in morally challenging contexts

Across the studies analyzed, empathy in morally challenging situations involves affective resonance and cognitive components of empathy. Empathic responses arise not solely from the perception of suffering, but depend on attributions of responsibility, intentions and social relations [5], [10], [13]. A central distinction across clusters is that between empathic distress and compassion. Empathic distress is primarily associated with strong affective activation with limited involvement of prefrontal networks, whereas compassion is accompanied by stronger engagement of cognitive and prefrontal components [18], [3]. Situations become morally challenging when intense affective resonance coincides with conflicting normative demands and limited possibilities for cognitive integration [19], [20]. In atypical populations, moral judgments often remain intact, while affective and cognitive components of empathy are integrated differently [21]. In summary, the findings suggest that difficulties in morally

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challenging situations are not driven by empathy per se, but by imbalances between affective resonance and cognitive components of empathy.

IV. Conclusion

This scoping review shows that empathy in conflictual and morally challenging situations cannot be understood as a stable reflex to suffering, but rather as a dynamic interplay of affective resonance and cognitive components of empathy. Empathic distress arises less from the mere perception of pain than from attributions of responsibility and limited possibilities for action, whereas compassion is associated with stronger engagement of cognitive components of empathy. The findings argue against a simple deficit model of atypical or clinical groups and instead point to specific shifts in the balance between affective and cognitive components of empathy. Future research should build on this mapping by testing these mechanisms in valid conflict and decision settings and by examining how affective resonance, attribution, and regulation interact over time.

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Author's statement

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References

[1] J. Decety and P. L. Jackson. The Functional Architecture of Human Empathy. *Behavioral and Cognitive Neuroscience Reviews*, 3(2):71–100, 2004, _eprint: https://doi.org/10.1177/1534582304267187. doi:10.1177/1534582304267187.

[2] T. Singer and C. Lamm. The Social Neuroscience of Empathy. *Annals of the New York Academy of Sciences*, 1156(1):81–96, 2009, _eprint: https://nyaspubs.onlinelibrary.wiley.com/doi/pdf/10.1111/j.1749-6632.2009.04418.x. doi:https://doi.org/10.1111/j.1749-6632.2009.04418.x.

[3] O. M. Klimecki. The Role of Empathy and Compassion in Conflict Resolution. *Emotion Review*, 11(4):310–325, 2019, _eprint: https://doi.org/10.1177/1754073919838609. doi:10.1177/1754073919838609.

[4] J. Decety and J. M. Cowell. The complex relation between morality and empathy. *Trends in Cognitive Sciences*, 18(7):337–339, 2014, doi:10.1016/j.tics.2014.04.008.

[5] J. D. Greene, R. B. Sommerville, L. E. Nystrom, J. M. Darley, and J. D. Cohen. An fMRI Investigation of Emotional Engagement in Moral Judgment. *Science*, 293(5537):2105–2108, 2001, _eprint: https://www.science.org/doi/pdf/10.1126/science.1062872. doi:10.1126/science.1062872.

[6] A. Tricco. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. *Annals of Internal Medicine*, 169(7):467–473, 2018, _eprint: https://doi.org/10.7326/M18-0850. doi:10.7326/M18-0850.

[7] N. R. Haddaway, M. J. Page, C. C. Pritchard, and L. A. McGuinness. PRISMA2020: An R package and Shiny app for producing PRISMA 2020-compliant flow diagrams, with interactivity for optimised digital transparency and Open Synthesis. *Campbell Systematic Reviews*, 18(2):e1230, 2022, doi:10.1002/cl2.1230.

[8] C. Lamm, J. Decety, and T. Singer. Meta-analytic evidence for common and distinct neural networks associated with directly experienced pain and empathy for pain. *NeuroImage*, 54(3):2492–2502, 2011, doi:https://doi.org/10.1016/j.neuroimage.2010.10.014.

[9] E. A. Caspar, K. Ioumpa, C. Keysers, and V. Gazzola. Obeying orders reduces vicarious brain activation towards victims' pain. *NeuroImage*, 222:117251, 2020, Place: United States. doi:10.1016/j.neuroimage.2020.117251.

[10] I. Patil, M. Calò, F. Fornasier, F. Cushman, and G. Silani. The behavioral and neural basis of empathic blame. *SCIENTIFIC REPORTS*, 7, 2017, doi:10.1038/s41598-017-05299-9.

[11] E. G. Bruneau, N. Dufour, and R. Saxe. Social cognition in members of conflict groups: Behavioural and neural responses in Arabs, Israelis and South Americans to each other's misfortunes. *Philosophical transactions of the Royal Society of London. Series B, Biological sciences*, 367(1589):717–730, 2012, Place: England. doi:10.1098/rstb.2011.0293.

[12] K. J. Yoder, C. Harenski, K. A. Kiehl, and J. Decety. Neural responses to morally laden interactions in female inmates with psychopathy. *NeuroImage. Clinical*, 30:102645, 2021, Place: Netherlands. doi:10.1016/j.nicl.2021.102645.

[13] A. Shenhav and J. Greene. Integrative Moral Judgment: Dissociating the Roles of the Amygdala and Ventromedial Prefrontal Cortex. *JOURNAL OF NEUROSCIENCE*, 34(13):4741–4749, 2014, doi:10.1523/JNEUROSCI.3390-13.2014.

[14] L. Tricoche, A. Rovai, S. Lo Bue, and E. A. Caspar. Neuro-cognitive specificities in prosocial disobedience: A comparative fMRI study of civilian and military populations. *PloS one*, 20(7):e0328407, 2025, Place: United States. doi:10.1371/journal.pone.0328407.

[15] H. Wang, Y. Zhang, L. Ao, R. Huang, Y. Meng, S. Jia, X. Zhang, and Y. Liu. Can guilt enhance sensitivity to other's suffering? An EEG investigation into moral emotions and pain empathy. *CEREBRAL CORTEX*, 35(2), 2025, doi:10.1093/cercor/bhae501.

[16] K. Schneider, K. D. Pauly, A. Gossen, L. Mevissen, T. M. Michel, R. C. Gur, F. Schneider, and U. Habel. Neural correlates of moral reasoning in autism spectrum disorder. *Social cognitive and affective neuroscience*, 8(6):702–710, 2013, Place: England. doi:10.1093/scan/nss051.

[17] M. Mazza, D. Tempesta, M. Pino, A. Nigri, A. Catalucci, V. Guadagni, M. Gallucci, G. Iaria, and M. Ferrara. Neural activity related to cognitive and emotional empathy in post-traumatic stress disorder. *BEHAVIOURAL BRAIN RESEARCH*, 282:37–45, 2015, doi:10.1016/j.bbr.2014.12.049.

[18] T. Singer and O. M. Klimecki. Empathy and compassion. *Current Biology*, 24(18):R875–R878, 2014, doi:10.1016/j.cub.2014.06.054.

[19] K. Yoder and J. Decety. Spatiotemporal neural dynamics of moral judgment: A high-density ERP study. *NEUROPSYCHOLOGIA*, 60:39–45, 2014, doi:10.1016/j.neuropsychologia.2014.05.022.

[20] Y. Zhan, X. Xiao, Q. Tan, J. Li, W. Fan, J. Chen, and Y. Zhong. Neural correlations of the influence of self-relevance on moral decision-making involving a trade-off between harm and reward. *PSYCHOPHYSIOLOGY*, 57(9), 2020, doi:10.1111/psyp.13590.

[21] R. J. P. Rijnders, S. van den Hoogen, J. van Honk, D. Terburg, and M. M. Kempes. Would you? Effects of oxytocin on moral choices in forensic psychopathic patients. *Comprehensive psychoneuroendocrinology*, 19:100245, 2024, Place: England. doi:10.1016/j.cpnec.2024.100245.

