**Supplementary Figures**

**Figure S1**

*Histogram with kernel density estimation of empathic disequilibrium*



*Notes*. Empathic disequilibrium was calculated as the standardized difference between cognitive and emotional empathy as measured using the Interpersonal Reactivity Index (*N* = 408).

**Figure S2**

*Zero-order Pearson correlations*



*Notes*. Asterisks indicate significant correlation (*p* < 0.05). AQ – Autism-Spectrum Quotient; SRP – Self-Report Psychopathy; BSI – Brief Symptom Inventory; ERS – Emotion Reactivity Scale. \* *p* < 0.05.

**Figure S3**

*Variance Inflation Factor*

*Notes*. Variance inflation factor (VIF) for each variable of the polynomial regression. Error bars signify the minimum and the maximum values of VIF across all models examined. A value of VIF ≥ 5 (dashed line) indicates serious multicollinearity that requires attention.

**Supplementary Tables**

**Tables S1**

*Examples of typical and mixed findings linking empathy and different psychopathologies*

|  |  |  |  |
| --- | --- | --- | --- |
| Psychopathology | Emotional empathy (e.g., typical findings) | Cognitive empathy (e.g., typical findings) | Null/Opposing evidence |
| Autism | **Intact**: Rogers et al. (2007); Dziobek et al. (2008); Gleichgerrcht et al. (2012); Pouw et al. (2013); Deschamps et al. (2014); Rueda et al. (2015); Senland and Higgins-D’Alessandro (2016); Mul et al. (2018); Shirayama et al. (2022) | **Impaired**: Rogers et al. (2007); Dziobek et al. (2008); Oberman et al. (2009); Hirevla and Helkama (2011); Gleichgerrcht et al. (2012); Pouw et al. (2013); Deschamps et al. (2014); Mazza et al. (2014); Adler et al. (2015); Rueda et al. (2015); Senland and Higgins-D’Alessandro (2016); Mul et al. (2018); Bos and Stokes (2019); Shirayama et al. (2022) | **Intact cognitive empathy**: Althaus et al. (2015); Lombardo et al. (2016)**Impaired emotional empathy:** Scambler et al. (2007); Oberman et al. (2009); Hirevla and Helkama (2011); Adler et al. (2015); Bos and Stokes (2019). |
| Schizophrenia | **Intact:** Achim et al. (2011); Vistoli et al. (2017); Atoui et al. (2018); Berger et al. (2019); van Donkersgoed et al. (2019) | **Impaired:** Benedetti et al. (2009); Abramowitz et al. (2014); Horan et al. (2016); Vistoli et al. (2017); Atoui et al. (2018); Berger et al. (2019); van Donkersgoed et al. (2019) | **Intact cognitive empathy:** Achim et al. (2011); Lehmann et al. (2014); López-del-Hoyo et al. (2019)**Elevated emotional empathy:** Lehmann et al. (2014); Horan et al. (2016)**Impaired emotional empathy:** Benedetti et al. (2009); Abramowitz et al. (2014); López-del-Hoyo et al. (2019) |
| Anti-social personality disorder | **Impaired:** Jones et al. (2010); van Zonneveld et al. (2017); Winter et al. (2017) | **Intact:** Richell et al. (2003); Jones et al. (2010); Schiffer et al. (2017); van Zonneveld et al. (2017); Winter et al. (2017) | **Intact emotional empathy:** Shamay-Tsoory et al. (2010); Yavuz et al. (2016); Schiffer et al. (2017)**Elevated emotional empathy:** Lishner et al. (2012)**Impaired cognitive empathy:** Shamay-Tsoory et al. (2010); Yavuz et al. (2016) |
| Major depressive disorder | **Intact (empathic concern) or elevated (personal distress):** Thoma et al. (2011); Derntl et al. (2012); Bennik et al. (2019)**Elevated:** Thoma et al. (2011); Derntl et al. (2012); Bennik et al. (2019) | **Elevated:** Wingenfeld et al. (2016)**Impaired:** Lee et al. (2005); Cusi et al. (2011); Wolkenstein et al. (2011); Bennik et al. (2019) | **Intact cognitive empathy:** Harkness et al. (2011); Thoma et al. (2011); Wolkenstein et al. (2011); Derntl et al. (2012)**Impaired emotional empathy:** Cusi et al. (2011); Wingenfeld et al. (2016) |
| Obsessive compulsive disorder | **Elevated:** Fontenelle et al. (2009); Kang et al. (2012); Kim et al. (2018); López-del-Hoyo et al. (2019); Salazar Kämpf et al. (2022) | **Intact:** Fontenelle et al. (2009); López-del-Hoyo et al. (2019); Salazar Kämpf et al. (2022)**Impaired:** Kang et al. (2012); Kim et al. (2018); López-del-Hoyo et al. (2019) |  |
| Social anxiety disorder | **Elevated**: Tibi-Elhanany and Shamay-Tsoory (2011); Gambin and Sharp (2018) | **Intact:** Campbell et al. (2009); Gambin and Sharp (2018)**Impaired:** Montagne et al. (2006); Gambin and Sharp (2018); Pepper et al. (2019) | **Elevated cognitive empathy:** Tibi-Elhanany and Shamay-Tsoory (2011)**Impaired emotional empathy:** Morrison et al. (2016)**Intact emotional empathy:** Pepper et al. (2019) |

**Table S2**

*Surface parameters for all models*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | b1cognitive empathy | b2emotional empathy | b3cognitive empathy2 | b4 cognitive x emotional empathy | b5emotional empathy2 |
| ERS | **A path** | 0.19[-1.54, 1.92] | **9.2\*\*\*****[7.41, 10.99]** | 0.76[-0.52, 2.04] | -0.51[-2.45, 1.43] | 0.30[-1.11, 1.71] |
| SRP | **C path** | **-1.76\*****[-3.02, -0.50]** | **-3.56\*\*\*****[-4.86, -2.25]** | -0.20[-1.13, 0.74] | **1.89\*****[0.48, 3.31]** | -0.19[0.83, -0.19] |
| **C' path** | **-1.80\*\*****[-3.01, -0.58]** | **-5.27\*\*\*****[-6.68, -3.86]** | -0.34[-1.24, 0.57] | **1.99\*\*****[0.62, 3.36]** | -0.25[-1.24, 0.74] |
| AQ - Social Behaviour | **C path** | **-3.11\*\*\*****[-4.00, -2.22]** | **2.46\*\*\*****[1.53, 3.39]** | -0.38[-1.04, 0.28] | **1.04\*[0.03, 2.06]** | -0.72[-1.45, 0.004] |
| **C' path** | **-3.12\*\*\*****[-3.99, -2.26]** | **1.68\*\*****[0.67, 2.69]** | -0.45[-1.09, 0.20] | **1.09\*****[0.09, 2.08]** | **-0.75\*****[-1.45, -0.04]** |
| AQ - Numbers/patterns | **C path** | 0.40[-0.004, 0.80] | -0.33[-0.75, 0.08] | 0.03[-0.27, 0.33] | 0.13[-0.33, 0.59] | 0.002[-0.33, 0.33] |
| **C' path** | **0.40\*****[0.0001, 0.78]** | **-0.68\*\*****[-1.14, -0.23]** | -0.002[-0.30, 0.29] | 0.15[-0.29, 0.59] | -0.01[-0.33, 0.31] |
| BSI - Depression | **C path** | **0.63\*****[0.005, 1.26]** | **-0.67\*****[-1.29, -0.05]** | 0.17[-0.32, 0.66] | -0.50[-1.24, 0.25] | 0.23[-0.26, 0.73] |
| BSI - Anxiety | **C path** | -0.09[-0.59, 0.42] | **0.87\*\*****[0.35, 1.38]** | -0.05[-0.42, 0.32] | 0.12[-0.45, 0.68] | 0.06[-0.35, 0.47] |
| **C' path** | -0.36[-0.97, 0.25] | **0.80\*****[0.18, 1.42]** | -0.31[-0.79, -0.17] | 0.61[-0.11, 1.33] | -0.36[-0.83, 0.12] |

*Notes*.Parameters (b1-b5) of the polynomial regression analyses for all the mediation models. A path represents the association between components of empathy and emotional reactivity (the mediator), the C path represents the total effect (without controlling for emotional reactivity), and the C’ path represents the direct effect after controlling for emotional reactivity. ERS – Emotion Reactivity Scale; SRP – Self-Report Psychopathy; AQ – Autism-Spectrum Quotient; BSI – Brief Symptom Inventory.

\* *p* < 0.05, \*\* *p* < 0.005, \*\*\* *p* < 0.0005.

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