SUPPLEMENTARY MATERIAL

TABLES

**Supplementary Table 1.** Description of the 114 voxel-based morphometry data-sets included in the structural meta-analysis.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Study** | **Clinical sample** | | | | | | | | **Control sample** | |
| **N (% male)** | **Age, y, Mean (SD)** | **Medication, % medicated** | **Illness duration, y, Mean (SD)** | **PANSS Total, Mean (SD)** | **PANSS Pos, Mean (SD)** | **PANSS Neg, Mean (SD)** | **PANSS Gen, Mean (SD)** | **N (% male)** | **Age, y, Mean (SD)** |
| Amann et al., 2016 | 45 (57.78) | 43.2 (9.1) | NA | 17.6 (11.8) | NA | 9.7 (5.3) | 10.4 (6.1) | NA | 45 (57.78) | 43.3 (9.9) |
| Ananth et al., 2002 | 20 (50) | 37.8 (9.5) | 100 | 15.85 (9.77) | NA | NA | NA | NA | 20 (50) | 38.6 (9.7) |
| Anderson et al., 2015 | 15 (86.67) | 34.3 (7.1) | 100 | 11.4 (4.7) | 62 (11) | 13 (5) | 20 (7) | 29 (4) | 20 (85) | 33.3 (8.4) |
| Asami et al., 2012 | 33 (84.85) | 22.5 (6.7) | 100 | 0.38 (0.39) | NA | NA | NA | NA | 36 (83.33) | 22.9 (3.8) |
| Bassitt et al., 2007 | 50 (76) | 31.7 (7.1) | 100 | 11.4 (7.4) | 59.1 (14.4) | 12.9 (4.7) | 19.8 (6.7) | 26.4 (NA)\* | 30 (70) | 31.2 (7.6) |
| Bergé et al., 2011 | 21 (57.14) | 24.81 (4.3) | 0 | NA | 84.43 (15.7) | 26.19 (7.4) | 17.48 (6.9) | 40.33 (11) | 20 (40) | 25.3 (3.7) |
| Bonilha et al., 2008 | 14 (78.57) | 40 (7) | 0 | NA | 96.16 (23.81) | 24.16 (8.55) | 21.25 (7.53) | 43.66 (9.93) | 13 (84.62) | 35 (8) |
| Bose et al., 2009 | 34 (100) | 39.5 (11) | 100 | 12 (9) | NA | NA | NA | NA | 33 (100) | 39.5 (12) |
| Brown et al., 2011 | 17 (47.06) | 44.8 (6.8) | 100 | 19.1 (6.2) | 56 (NA) | 12.3 (4.2) | 13.5 (2.9) | 30.2 (3.6) | 21 (47.62) | 45 (10.2) |
| Burrer et al., 2020 | 60 (75) | 30.5 (8.4) | 93.33 | 8.4 (7.3) | 48.7 (10.4) | 6.6 (2.5) | 13.2 (5.6) | 28.9 (NA)\* | 58 (58.62) | 30.3 (8.2) |
| Cancel et al., 2015 | 21 (71.43) | 32.1 (8.3) | 100 | 9.98 (6.93) | NA | NA | NA | NA | 30 (66.67) | 32.9 (7.2) |
| Cascella et al., 2010 | 50 (74) | 40.87 (11.74) | NA | 16.7 (11.3) | NA | NA | NA | NA | 90 (47.48) | 46.3 (12.7) |
| Chua et al., 2007 | 26 (46.15) | 32 (10) | 0 | 0.33 (NA) | 72 (17) | NA | NA | NA | 38 (47.37) | 33 (8.1) |
| Cooke et al., 2008 | 52 (76.92) | 38.35 (9.89) | 100 | 13.9 (9.6) | 66.2 (13.7) | 16.5 (4.9) | 18 (4.9) | 31.8 (6.3) | 30 (80) | 32.13 (12.38) |
| Cui et al., 2011 | 23 (69.57) | 24.78 (5.09) | 100 | 1.36 (NA)\* | NA | 22.48 (3.45) | 20.91 (4.54) | NA | 36 (58.33) | 26.56 (6.7) |
| Delvecchio et al., 2017 | 61 (50.82) | 40.8 (11.2) | 100 | 14.6 (11.2) | NA | NA | NA | NA | 59 (59.32) | 40.2 (11.3) |
| Donohoe et al., 2011 | 70 (65.71) | 40.44 (11.7) | 100 | 17.82 (10.59) | 106.63 (NA)\* | 24.52 (13) | 25.44 (14.35) | 56.68 (27.36) | 38 (52.63) | 32.49 (12.74) |
| Ediri Arachchi et al., 2020 | 116 (42.24) | 33.75 (9.5) | NA | 9.72 (7.99) | 71.1 (22.3) | 16.8 (7.7) | 20 (8.9) | 34.3 (10.5) | 116 (51.72) | 33.41 (10.9) |
| Ellison-Wright et al., 2014 | 21 (80.95) | 34.2 (10.9) | 100 | NA | 50 (13) | NA | NA | NA | 21 (66.67) | 31.5 (9.1) |
| Euler et al., 2009 | 19 (90) | 43.26 (10.5) | 100 | NA | NA | NA | NA | NA | 23 (69.57) | 43.3 (11.9) |
| Frascarelli et al., 2015 | 15 (60) | 42.7 (7.4) | 100 | 17.2 (5.1) | 80.8 (20.3) | 15.3 (6.2) | 24.9 (9.4) | 40.6 (8.9) | 24 (37.5) | 30.3 (10.2) |
| Fukuta et al., 2013 | 40 (0) | 45.6 (8.08) | 100 | 23 (12.33) | NA | NA | NA | NA | 50 (0) | 45 (8.7) |
| García-Martí et al., 2008 | 17 (100) | 35.71 (6.11) | 100 | NA | NA | NA | NA | NA | 19 (100) | 33.11 (7.61) |
| Guller et al., 2012 | 14 (71.43) | 32.93 (7.53) | 100 | 11 (7) | 70.1 (17.7) | 15.6 (6) | 20.7 (6) | 33.8 (10.5) | 14 (71.43) | 34 (8.04) |
| Guo et al., 2014 | 19 (NA) | 23.95 (7.49) | 100 | 0.78 (0.73) | 77.79 (16.16) | 19.47 (4.66) | 20.26 (6) | 38.05 (8.76) | 19 (NA) | 25.16 (8.07) |
| Guo et al., 2015 | 49 (61.22) | 22.69 (4.62) | 0 | 1.87 (0.56) | 91.31 (10.98) | 22.27 (5.33) | 22.82 (6.86) | 46.22 (NA)\* | 50 (46) | 23.48 (2.49) |
| Herold et al., 2009 | 18 (61.11) | 28.7 (10.3) | 100 | 3.4 (4.1) | 68.3 (12.9) | 14.2 (4.2) | 19.6 (5.7) | 34.6 (6.6) | 21 (52.38) | 27.4 (6.5) |
| Hirao et al., 2008 | 20 (50) | 36.7 (7.6) | 100 | 10.6 (7.4) | 63.3 (NA) | 14.6 (6.4) | 16.2 (5.4) | 32.5 (11.6) | 20 (50) | 35 (7.1) |
| Honea et al., 2008 | 169 (78.1) | 36.39 (9.46) | 100 | NA | NA | 12.79 (5.69) | 19.52 (9.4) | NA | 212 (48.58) | 33.31 (9.86) |
| Horn et al., 2009 | 13 (61.54) | 29.6 (11.2) | 84.62 | 2.79 (2.6) | 63.9 (16.7) | 13.8 (4.8) | 15.5 (6.1) | 34.6 (NA)\* | 13 (61.54) | 26.6 (4.6) |
| Horn et al., 2010 | 20 (65) | 30.1 (10) | NA | NA | 64.85 (15.2) | NA | NA | NA | 20 (NA) | NA |
| Huang et al., 2015 | 18 (55.56) | 22.56 (6.73) | 0 | 0.5 (0.49) | 106.44 (13.55) | 31.11 (6.92) | 25.78 (3.87) | 49.56 (9.01) | 18 (50) | 25.06 (2.44) |
| Ivleva et al., 2012 | 19 (52.63) | 39.89 (10.66) | 94.74 | 15.74 (8.99) | NA | NA | NA | NA | 10 (40) | 43.9 (9.86) |
| Ivleva et al., 2013 | 146 (69.9) | 35.8 (12.9) | 96.58 | 14.3 (NA)\* | 65 (17.4) | 16.6 (5.5) | 16.9 (6.4) | 31.6 (8.6) | 200 (46) | 39.8 (12.1) |
| Iwashiro et al., 2016 | 18 (66.67) | 24.6 (5.8) | 100 | 0.98 (1.17) | 70.8 (NA)\* | 16.3 (5.4) | 18.9 (5.1) | 35.6 (8.3) | 16 (62.5) | 23.8 (6.5) |
| Jayakumar et al., 2005 | 18 (50) | 24.9 (6.3) | 0 | 0.86 (0.43) | 79 (18) | 19 (8) | 23 (7) | 36 (8) | 18 (50) | 25.7 (7.5) |
| John et al., 2015 | 45 (71.1) | 28.13 (8.36) | 33.33 | 2.04 (1.51) | 56.78 (12.26) | 15.09 (5.29) | 15.16 (4.82) | 26.53 (5.96) | 45 (77.8) | 26.84 (6.21) |
| Kašpárek et al., 2007 | 22 (100) | 23.7 (4.1) | 100 | NA | NA | NA | NA | NA | 18 (100) | 24.1 (1.6) |
| Kašpárek et al., 2010 | 49 (100) | 23.6 (4.6) | 100 | NA | NA | NA | NA | NA | 127 (100) | 24.8 (3) |
| Kawada et al., 2009 | 26 (42.3) | 36.7 (8.6) | 100 | 9.9 (7.7) | 61.1 (18.1) | 14.5 (5.5) | 15.5 (5.1) | 31.1 (9.3) | 26 (42.3) | 36.3 (8.8) |
| Kawasaki et al., 2007 | 30 (100) | 24.7 (4.4) | 100 | 4 (4.7) | NA | NA | NA | NA | 30 (100) | 25.4 (4.4) |
| Kim et al., 2017 | 22 (54.55) | 31.7 (10.1) | 90.91 | 9.2 (6.6) | 79.1 (NA)\* | 18.4 (5.2) | 21.1 (6) | 39.6 (6.8) | 22 (54.55) | 31.6 (9.5) |
| Koelkebeck et al., 2013 | 18 (66.67) | 34.9 (10.1) | 100 | 11.8 (8.8) | NA | 12.8 (3.7) | 15.1 (4.7) | NA | 30 (46.67) | 39.1 (10.8) |
| Koutsouleris et al., 2008 | 175 (74.29) | 31.7 (10.2) | 86.29 | 4.3 (NA)\* | 83.3 (28.8) | 19 (7.8) | 22.3 (9.8) | 42 (16.2) | 177 (69.49) | 31.5 (9.2) |
| Kubicki et al., 2002 | 16 (87.5) | 26 (7.5) | 100 | NA | NA | NA | NA | NA | 18 (88.89) | 24 (4.5) |
| Langbein et al., 2018 | 27 (48.15) | 25.3 (3.52) | 0 | NA | 60.4 (8.2) | 29.7 (4.1) | 28.8 (9.7) | 40.2 (6.6) | 31 (58.06) | 25.12 (4.68) |
| Ledoux et al., 2014 | 21 (76.19) | 32.05 (1.08) | NA | 11.38 (4.93) | 64 (13) | 15.14 (4.33) | 18.14 (5.68) | 30.71 (6.93) | 22 (72.72) | 30.45 (1.25) |
| Lee et al., 2020 | 65 (55.38) | 36.98 (7.88) | 100 | 15.52 (7.52) | NA | NA | NA | NA | 65 (43.08) | 34.52 (8.93) |
| Lei et al., 2019 | 14 (71.43) | 21.79 (5.35) | 0 | 1.11 (NA)\* | 96.21 (17.27) | 20.93 (6.62) | 26.86 (6.88) | 48.43 (10.94) | 32 (71.88) | 21.59 (4.65) |
| Li et al., 2020 | 86 (53.49) | 23.5 (6.9) | 0 | 14.2 (15.3) | 86.8 (14.2) | 21.7 (5.4) | 20.6 (7.3) | 44.1 (8.4) | 86 (52.33) | 24 (6.3) |
| Liao et al., 2015 | 93 (61.29) | 27 (6.6) | 100 | 4.51 (4.59) | 77.3 (9.5) | 23.4 (4.2) | 18.3 (5.8) | 35.7 (5.2) | 99 (53.54) | 25.8 (5.4) |
| Lui et al., 2009 | 10 (50) | 22 (8.2) | NA | 0.34 (0.26) | 101.7 (15.5) | 24.4 (5.4) | 18.6 (4.1) | 58.7 (NA)\* | 10 (50) | 23 (7.9) |
| Madeira et al., 2020 | 20 (65) | 31.5 (10.3) | 100 | 6 (7.9) | NA | NA | NA | NA | 20 (65) | 31.5 (10.3) |
| Maggioni et al., 2017 | 243 (62.55) | 33.24 (9.41) | 95.88 | 7.08 (NA)\* | 73.38 (18.59) | NA | NA | NA | 383 (50.91) | 30.4 (9.2) |
| Martin et al., 2014 | 26 (NA) | NA | NA | NA | NA | NA | NA | NA | 19 (NA) | NA |
| Meisenzahl et al., 2008 | 165 (74.55) | 31.43 (9.59) | 85.45 | 4.59 (7.62) | 83.85 (28.3) | 19.02 (7.73) | 22.45 (9.79) | 42.37 (NA)\* | 177 (69.49) | 31.5 (9.2) |
| Molina et al., 2010 | 30 (63.67) | 25.8 (5) | 100 | 14.5 (9.3) | 82.6 (NA)\* | 21.9 (6.4) | 19.2 (9.1) | 41.5 (14.8) | 40 (57.5) | 29.4 (9) |
| Molina et al., 2011a | 30 (53.33) | 34.1 (10.6) | 83.33 | 13.4 (5.9) | 97.3 (16.5) | 28.3 (5.1) | 24.1 (6.7) | 44.9 (NA)\* | 31 (58.06) | 36.83 (12.19) |
| Molina et al., 2011b | 38 (68.42) | 34.4 (10.5) | 100 | 9.8 (7.9) | 99.7 (NA)\* | 23.2 (6.4) | 27 (7.9) | 49.5 (13.9) | 24 (66.67) | 34.6 (8.6) |
| Moorhead et al., 2004 | 25 (56) | 50.9 (8.9) | NA | NA | NA | NA | NA | NA | 29 (44.83) | 42.8 (9.9) |
| Nakamura et al., 2013 | 34 (58.82) | 24.7 (5.5) | 97.05 | 1.4 (NA)\* | NA | NA | NA | NA | 51 (58.82) | 23.9 (1.8) |
| Neckelmann et al., 2006 | 12 (NA) | NA | 100 | NA | NA | NA | NA | NA | 12 (NA) | NA |
| Nemoto et al., 2020 | 95 (60) | 29.8 (5.2) | NA | 8.3 (5.8) | NA | NA | NA | NA | 95 (60) | 29.9 (5.1) |
| Nenadic et al., 2015a | 24 (50) | 24.9 (3.1) | 0 | 0.34 (0.16) | 53.2 (6.3) | 30.4 (4.9) | 29.1 (8.1) | 44.3 (7.2) | 49 (53.06) | 23.8 (3) |
| Nenadic et al., 2015b | 34 (61.76) | 34.33 (10.62) | 88.24 | 8.9 (5.9) | NA | NA | NA | NA | 34 (52.94) | 34.33 (10.62) |
| Neugebauer et al., 2019 | 18 (61.11) | 36.94 (9.9) | 100 | 12.58 (9.67) | 84.78 (29.13) | 15.33 (6.17) | 23.61 (9.56) | 43.83 (15.77) | 19 (63.16) | 35.79 (11.56) |
| Onay et al., 2017 | 20 (50) | 36.5 (10.5) | 100 | 10.7 (8.9) | NA | NA | NA | NA | 16 (43.75) | 34.4 (9.1) |
| Ortiz-Gil et al., 2011 | 23 (73.91) | 40.1 (10.22) | 100 | 18.28 (10.02) | 66.57 (17.11) | NA | NA | NA | 39 (76.92) | 40.1 (11.58) |
| Ota et al., 2017 | 37 (45.94) | 36.2 (9.5) | NA | 13.5 (8.9) | 65.1 (15.7) | 15.2 (4.3) | 17.2 (5.8) | 32.7 (8.2) | 62 (27.41) | 40.6 (13.3) |
| Özdemir et al., 2012 | 18 (50) | 40.77 (12.27) | 100 | 12.24 (7.95) | 60.94 (15.3) | 13.4 (6.52) | 16.2 (7.35) | 34 (9.58) | 17 (52.94) | 40.77 (12.27) |
| Picado et al., 2015 | 20 (55) | 35.9 (0.73) | 100 | NA | 59.35 (16.4) | 12.25 (3.66) | 15.5 (5.29) | 31.6 (NA)\* | 20 (60) | 33.2 (6.61) |
| Plaze et al., 2011 | 15 (66) | 31 (8) | 100 | 8.7 (8.4) | NA | NA | NA | NA | 20 (60) | 31.9 (7.4) |
| Poletti et al., 2016 | 96 (69.8) | 37.24 (9.33) | 100 | 12.61 (8.68) | 50.64 (NA)\* | 17.62 (5.98) | 20.41 (4.55) | 12.61 (8.68) | 136 (50) | 33.31 (12.97) |
| Pomarol-Clotet et al., 2010 | 32 (65.63) | 41.56 (8.79) | 100 | 21.79 (9.09) | 71.97 (17.01) | 17.07 (5.88) | 19.14 (7.35) | 31.61 (8.86) | 32 (65.63) | 41.03 (11.04) |
| Ruef et al., 2012 | 15 (100) | 22 (2.2) | 100 | NA | NA | NA | NA | NA | 16 (100) | 22.5 (2.7) |
| Ružić Baršić et al., 2020 | 61 (59.02) | 30.3 (11.6) | NA | 7.2 (NA)\* | NA | NA | NA | 50.1 (8.2) | 63 (47.62) | NA |
| Salgado-Pineda et al., 2004 | 14 (50) | 25.05 (4.05) | 100 | NA | NA | NA | NA | NA | 14 (NA) | 25.14 (3.32) |
| Salgado-Pineda et al., 2011 | 14 (64.29) | 37.3 (8.9) | 100 | 14 (6.7) | 60.7 (12) | 24.7 (8.4) | 13.1 (5.5) | 22.9 (NA)\* | 14 (64.29) | 34.6 (6) |
| Sanjuán et al., 2020 | 61 (100) | 31.87 (10.06) | NA | NA | 64.24 (18.15) | 15.8 (5.68) | 16.5 (6.41) | 31.98 (8.77) | 18 (100) | 38.24 (7.89) |
| Sans-Sansa et al., 2013 | 31 (77.42) | 40.71 (8.61) | 100 | NA | 63.81 (16.85) | 13.07 (5.07) | 14.85 (6.93) | 7.52 (2.61) | 59 (71.19) | 38.31 (10.49) |
| Schiffer et al., 2010 | 12 (100) | 37.8 (9) | 100 | 16.8 (7.2) | 67 (NA)\* | 14.6 (4.1) | 20.5 (4.5) | 31.9 (5.9) | 14 (100) | 36.7 (11.4) |
| Schuster et al., 2012 | 27 (52) | 59.9 (9.1) | 89.29 | 29.2 (9.6) | 64 (24.6) | 20 (8.7) | 25.7 (8) | 48.3 (2) | 40 (43) | 62.2 (7.8) |
| Shepherd et al., 2015 | 40 (60) | 42.93 (10.6) | 92.5 | 17.84 (NA)\* | 63.54 (NA)\* | 15.33 (6.1) | 16.23 (6.3) | 31.98 (8.9) | 34 (47.06) | 32.6 (10.6) |
| Siddi et al., 2019 | 26 (57.69) | 36.9 (9.1) | 100 | 13.2 (9.9) | NA | NA | NA | NA | 24 (58.33) | 41.1 (9.7) |
| Singh et al., 2014 | 14 (57.14) | 34.06 (9.89) | 100 | 9.6 (4.3) | NA | NA | NA | NA | 14 (50) | 32.63 (7.64) |
| Singh et al., 2015 | 14 (78.57) | 31.5 (9.4) | 100 | 10.03 (6.96) | NA | NA | NA | NA | 14 (71.43) | 27.21 (4.78) |
| Singh et al., 2018 | 28 (42.86) | 33.89 (9.34) | 100 | 9.99 (6.74) | NA | NA | NA | NA | 28 (50) | 31.44 (7.36) |
| Song et al., 2015 | 71 (40.85) | 35.6 (14.7) | 100 | NA | 80.3 (12.2) | 25.5 (5.3) | 15.2 (5.1) | 39.6 (NA)\* | 35 (31.43) | 33.9 (14.5) |
| Spalletta et al., 2013 | 53 (66.04) | 42.51 (11.51) | 100 | NA | 94.04 (NA)\* | 22.55 (5.52) | 21.02 (7.6) | 48.47 (10.71) | 75 (66.67) | 41.6 (15.7) |
| Stegmayer et al., 2014 | 43 (62.79) | 34.1 (10.9) | 93.02 | 8.7 (9.3) | 57.4 (17.3) | 15.4 (5.7) | 14.6 (6.4) | 27.4 (NA)\* | 34 (47.06) | 37.1 (12.3) |
| Stip et al., 2017 | 15 (66.67) | 33.2 (7.4) | 100 | NA | 77.15 (5.36) | 17.3 (3.32) | 18.6 (3.47) | 42 (3.18) | 15 (40) | 30.6 (6.2) |
| Suazo et al., 2014 | 17 (58.82) | 33.29 (10.48) | 0 | 5.28 (9.14) | 74.2 (11.21) | 20.93 (4.28) | 16.53 (3.94) | 36.74 (NA)\* | 13 (76.92) | 30.92 (11.48) |
| Sun et al., 2020 | 46 (28.26) | 29.7 (8.9) | 91.3 | 3.51 (4.61) | NA | NA | NA | NA | 56 (37.5) | 29.54 (9.41) |
| Szendi et al., 2017 | 21 (52.4) | 39 (NA) | 100 | 14 (NA) | 61 (NA) | 11 (NA) | 18.13 (NA) | 31 (NA) | 13 (46.2) | 34 (NA) |
| Tan et al., 2015 | 18 (61.11) | 40.5 (5.48) | 100 | 15.9 (6.3) | 59.1 (12.3) | 8.7 (3.7) | 21.7 (6) | 28.7 (NA)\* | 17 (58.82) | 41.2 (3.85) |
| Tian et al., 2011 | 30 (56.67) | 22.63 (3.76) | 100 | 3.25 (2.77) | 67.27 (11.81) | 19.37 (4.6) | 16.13 (4.65) | 31.77 (NA)\* | 30 (60) | 22.77 (3.34) |
| Tomelleri et al., 2009 | 70 (64.29) | 39.73 (10.94) | 97.14 | 14.13 (10.73) | NA | NA | NA | NA | 79 (51.9) | 40.29 (11.91) |
| Tordesillas-Gutierrez et al., 2015 | 101 (66.34) | 26.93 (5.58) | 100 | 0.55 (NA)\* | NA | NA | NA | NA | 69 (69.57) | 26.16 (5.96) |
| Tregellas et al., 2007 | 32 (65.62) | 39.6 (8.8) | 100 | NA | NA | NA | NA | NA | 32 (43.75) | 35.3 (9.3) |
| Van Tol et al., 2014 | 51 (86.27) | 34.04 (11.4) | 80.39 | 8.77 (8.71) | 58.24 (NA)\* | 14.03 (NA) | 14.37 (4.18) | 29.84 (7.29) | 51 (72.55) | 36.14 (10.93) |
| Venkatasubramanian, 2010 | 30 (70) | 30.1 (8.3) | 0 | 3.48 (2.99) | 84 (NA)\* | 22 (8) | 23 (9) | 39 (8) | 27 (70.37) | 27.4 (7) |
| Vijayakumari et al., 2015 | 41 (70.73) | 27.34 (7.48) | 39.02 | 2.05 (1.5) | 54.67 (17.32) | 14.42 (6.77) | 14.27 (6.43) | 25.97 (8.94) | 39 (82.05) | 26.26 (5.85) |
| Walther et al., 2011 | 11 (73) | 35.36 (12.54) | 100 | 8.93 (13.29) | 54.27 (14.11) | 11.73 (4.45) | 18 (7.59) | 24.54 (NA)\* | 14 (57) | 31.71 (6.08) |
| Wang et al., 2010 | 23 (65.22) | 30 (9.2) | 95.65 | 8.1 (8) | NA | NA | NA | NA | 33 (48.48) | 27.3 (7.6) |
| Watson et al., 2012 | 25 (76) | 28.8 (9) | 100 | 1.24 (0.83) | 69 (14) | NA | NA | NA | 25 (76) | 28.2 (8.5) |
| Whitford et al., 2005 | 31 (64.52) | 19.3 (3.5) | 87.1 | 0.53 (0.68) | NA | NA | NA | NA | 30 (66.67) | 19.3 (3) |
| Wolf et al., 2008 | 28 (71.43) | 33.1 (7) | 96.43 | 5.82 (4.48) | 63 (18.4) | 13 (4.9) | 18.4 (9.2) | 31.6 (NA)\* | 14 (64.39) | 30.9 (9.5) |
| Xu et al., 2009 | 120 (57.5) | 42.1 (12.9) | 100 | NA | NA | NA | NA | NA | 120 (45.83) | 42.8 (16.57) |
| Yamada et al., 2007 | 20 (50) | 38.8 (7.2) | 100 | 11.6 (8.7) | 64.5 (19.8) | 16.4 (6.7) | 15.7 (6.5) | 32.4 (10.1) | 20 (50) | 39.1 (7.1) |
| Yang et al., 2019 | 37 (56.76) | 42.03 (8.44) | 100 | 18.41 (5.35) | 51.15 (NA)\* | 10.05 (3.99) | 15.32 (5.35) | 25.78 (7.04) | 28 (57.14) | 40.54 (10.87) |
| Yokoyama et al., 2018 | 60 (63.33) | 38.03 (8.95) | 100 | 11.26 (9.36) | 56.83 (NA)\* | 12.22 (6.97) | 14.4 (4.82) | 30.2 (9.19) | 40 (72.5) | 35.05 (7.62) |
| Yue et al., 2016 | 20 (50) | 24.45 (5.51) | 100 | 1.91 (1.94) | 88.95 (14.86) | 21.25 (5.42) | 19.1 (6.26) | 48.6 (8.1) | 24 (54.17) | 24.79 (6.11) |
| Zhang et al., 2017 | 49 (40.82) | 32.88 (5.94) | 0 | 0.4 (0.61) | 89.22 (17.15) | 25.89 (5.85) | 16.7 (6.38) | 46.63 (9.89) | 57 (45.61) | 32.88 (6.26) |
| Zhang et al., 2018 | 32 (68.75) | 22.7 (4) | 0 | 0.86 (0.74) | 104.3 (17.8) | 26.2 (4.6) | 25.6 (7.4) | 52.4 (10) | 29 (58.62) | 22.1 (3.6) |

Abbreviations: SD, standard deviation; PANSS, The Positive and Negative Syndrome Scale; NA, not available. \*Duration of illness calculated based on reported age and age of onset; PANSS Total/subscales’ score calculated based on the reported scores on the other 3.

**Supplementary Table 2.** Description of the 143 functional magnetic resonance imaging data-sets included in the neurocognitive meta-analysis.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Study** | **Clinical sample** | | | | | | | | **Control sample** | |
| **N (% male)** | **Age, y, Mean (SD)** | **Medication, % medicated** | **Illness duration, y, Mean (SD)** | **PANSS Total, Mean (SD)** | **PANSS Pos, Mean (SD)** | **PANSS Neg, Mean (SD)** | **PANSS Gen, Mean (SD)** | **N (% male)** | **Age, y, Mean (SD)** |
| Anticevic et al., 2011 | 28 (78.57) | 36.39 (9.54) | 100 | NA | NA | NA | NA | NA | 24 (75) | 37.18 (7.59) |
| Arce et al., 2006 | 17 (76.47) | 40.88 (7.52) | 100 | 13.91 (9.45) | 61.22 (NA)\* | 17.75 (12.82) | 17.07 (10.07) | 26.4 (12.42) | 17 (82.35) | 39.82 (7.99) |
| Backes et al., 2011 | 17 (58.82) | 33.71 (7.99) | 100 | 3.07 (4.16) | 101 (NA)\* | 15.73 (5.5) | 18.01 (8.27) | 67.26 (22.07) | 17 (64.7) | 29.47 (7.62) |
| Barch et al., 2002 | 38 (63.15) | 36.3 (10.3) | 100 | 13 (11.5) | NA | NA | NA | NA | 48 (45.83) | 36.5 (11.2) |
| Becerril et al., 2011 | 37 (68) | 36.86 (9.14) | 100 | 17.4 (11.2) | NA | NA | NA | NA | 32 (66) | 36.19 (10.86) |
| Bertolino et al., 2006 | 25 (80) | 26.2 (6.5) | 100 | NA | 62.7 (19.7) | NA | NA | NA | 25 (80) | 27.4 (5.7) |
| Boksman et al., 2005 | 10 (90) | 22 (5) | 0 | 1.42 (0.83) | NA | NA | NA | NA | 10 (90) | 23 (4) |
| Bonner-Jackson et al., 2005 | 17 (88.2) | 21.8 (2.9) | NA | NA | NA | NA | NA | NA | 26 (50) | 21.2 (3.4) |
| Bor et al., 2011 | 22 (77.27) | 28.4 (7.2) | 100 | 5.4 (3.9) | 75.6 (NA)\* | 17.6 (4.8) | 21 (4.3) | 37 (6.8) | 15 (73.33) | 30.3 (7.3) |
| Callicott et al., 2000 | 13 (76.92) | 33.9 (9) | NA | NA | NA | NA | NA | NA | 18 (61.11) | 29.6 (7) |
| Chakirova et al., 2011 | 20 (65) | 37 (10.1) | 100 | 16.7 (10.2) | 43.1 (NA)\* | 10.5 (2.9) | 10.5 (3.9) | 22.1 (6.4) | 33 (54.55) | 37.3 (12.1) |
| Chen et al., 2016 | 22 (63.63) | 33.31 (8.45) | 100 | 7.45 (5.33) | 42.63 (8.59) | NA | NA | NA | 25 (64) | 32.04 (9.62) |
| Choi et al., 2008 | 10 (20) | 30.3 (6.4) | 10 (30) | 29.2 (10.3) | 100 | 4.3 (4.4) | 58.4 (11.4) | 13.2 (2.6) | 15.9 (2.9) | 29.3 (NA)\* |
| Choi et al., 2012 | 15 (53.33) | 23.47 (4.41) | 100 | 4.69 (2.6) | 55 (14.43) | 13.2 (3.34) | 16.47 (6.5) | 25.33 (6.62) | 16 (56.25) | 21.37 (2.28) |
| Cieslik et al., 2013 | 18 (55.55) | 37.1 (9.2) | 94.44 | 10.6 (7.7) | 50.5 (NA)\* | 11.5 (4.2) | 13.9 (6.1) | 25.1 (6.9) | 18 (55.56) | 36.6 (10.3) |
| Cohen et al., 2015 | 19 (84.21) | 20.15 (2.25) | 100 | 1.15 (NA)\* | NA | NA | NA | NA | 34 (88.24) | 21.35 (2.55) |
| Collier et al., 2014 | 25 (60) | NA | 100 | NA | NA | NA | NA | NA | 28 (53.57) | NA |
| Costafreda et al., 2011 | 32 (81.25) | 35.5 (10.7) | 93.75 | 11.4 (7.3) | NA | NA | NA | NA | 40 (50) | 35.8 (11.3) |
| Cuervo-Lombard et al., 2012 | 13 (100) | 30.7 (5.3) | 100 | 10.5 (3.7) | 67.5 (6.9) | 12.9 (3.2) | 23 (4) | 31.6 (5.2) | 14 (100) | 30.1 (5) |
| Dehaene et al., 2003 | 13 (100) | 28.1 (NA) | 100 | NA | 72 (NA)\* | 14 (6) | 23 (7) | 35 (9) | 12 (100) | 27.4 (NA) |
| Dollfus et al., 2008 | 23 (78.3) | 29.9 (7.9) | NA | 7.6 (7.2) | 49.5 (14.8) | 11.7 (4.5) | 13.1 (5) | 24.7 (NA)\* | 23 (78.3) | 30 (8.6) |
| Eich et al., 2014 | 18 (61.11) | 37.9 (9.3) | 100 | NA | NA | NA | NA | NA | 18 (72.22) | 36.3 (8.2) |
| Eryilmaz et al., 2016 | 40 (65) | 42.3 (1.6) | 100 | 17 (1.4) | 72.4 (2.1) | NA | NA | NA | 40 (77.5) | 37.7 (1.6) |
| Esslinger et al., 2007 | 21 (100) | 29.8 (9) | 100 | 6.2 (6.8) | 59.8 (13.8) | 11.3 (4) | 17.6 (5.5) | 30.9 (NA)\* | 21 (100) | 29.8 (8.9) |
| Ettinger et al., 2011 | 45 (77.77) | 37.33 (8.19) | 97.78 | 13.49 (9.78) | 66.33 (12.66) | 16.18 (4.72) | 17.67 (4.48) | 32.49 (6.01) | 19 (63.16) | 33.32 (9.21) |
| Eyler et al., 2008 | 17 (88.23) | 47.2 (11.3) | 100 | 22.9 (12.9) | NA | NA | NA | NA | 14 (71.43) | 45.5 (16.2) |
| Fassbender et al., 2014 | 25 (72) | 19.9 (3.8) | 64 | 0.59 (0.26) | NA | NA | NA | NA | 26 (38.46) | 19.3 (3.6) |
| Fatjó-Vilas et al., 2012 | 48 (70.83) | 38.48 (9.31) | 100 | 18.17 (8.61) | 73.77 (NA)\* | 17.88 (6.65) | 22.05 (7.67) | 33.84 (9.21) | 46 (36.96) | 35.91 (12.09) |
| Folley et al., 2010 | 34 (73.53) | 37.8 (11.3) | NA | NA | 66 (23.6) | NA | NA | NA | 28 (57.14) | 33.2 (11.1) |
| Fuentes-Claramonte et al., 2020 | 70 (74.29) | 42.61 (9.94) | 100 | NA | 76.12 (NA)\* | 17.94 (5.74) | 21.84 (6.86) | 36.34 (9.14) | 70 (74.29) | 40.21 (11.11) |
| Garrison et al., 2017 | 20 (90) | 36.3 (7.4) | 100 | 13.6 (5.4) | NA | 14.9 (4.5) | 14.1 (6.1) | NA | 20 (90) | 33.4 (8) |
| Geisler et al., 2015 | 40 (35) | 29.8 (9.9) | NA | 8.14 (8.92) | NA | NA | NA | NA | 155 (40) | 31.4 (11.1) |
| Grot et al., 2017 | 19 (73.68) | 36.3 (1.7) | 100 | NA | 66.43 (NA)\* | 16.16 (1.18) | 15.89 (0.9) | 34.38 (2.04) | 23 (65.22) | 32.78 (2.52) |
| Guerrero-Pedraza et al., 2012 | 30 (70) | 25.93 (5.82) | 90 | NA | 60.3 (17.34) | 14.97 (5.18) | 15.03 (7.96) | 30.3 (8.14) | 28 (71.43) | 27.43 (7.01) |
| Guimond et al., 2017 | 35 (85.71) | 32.63 (7.82) | 100 | 9.74 (4.53) | NA | NA | NA | NA | 23 (78.26) | 33.78 (8.17) |
| Guimond et al., 2018 | 20 (60) | 26.9 (7.63) | 100 | 4.37 (2.39) | NA | NA | NA | NA | 20 (75) | 25.05 (4.05) |
| Guse et al., 2013 | 25 (76) | 36 (NA) | 100 | NA | 81.7 (11.9) | 15.3 (4.4) | 23.9 (3.5) | 42.3 (7.2) | 22 (72.73) | 36 (NA) |
| Habel et al., 2010 | 14 (100) | 37.14 (8.81) | 85.71 | 9.66 (7.9) | 84.5 (NA)\* | 19.42 (6.86) | 23.5 (9.52) | 41.58 (13.06) | 14 (100) | 35.5 (9.31) |
| Hall et al., 2010 | 15 (80) | 38.1 (10.4) | 100 | NA | 48.4 (10.3) | 13 (3.8) | 12.3 (2.8) | 23.1 (NA)\* | 14 (71.43) | 33.7 (7.9) |
| Hamilton et al., 2009 | 20 (70) | 32.4 (9.45) | 100 | 8.79 (7.75) | NA | NA | NA | NA | 38 (60.53) | 32.5 (11.68) |
| Han et al., 2007 | 12 (100) | 39.75 (11.89) | 100 | 16.92 (11.25) | NA | NA | NA | NA | 12 (100) | 45.5 (6.47) |
| Harrison et al., 2007 | 12 (100) | 31.6 (8.4) | 91.67 | 9.9 (6.7) | NA | 13.4 (3.7) | 14.4 (5.52) | NA | 14 (100) | 31.5 (7.5) |
| Harvey and Lepage, 2014 | 28 (60.71) | 31 (8.8) | 100 | 9.7 (NA)\* | NA | NA | NA | NA | 26 (50) | 30.7 (9.8) |
| Hawco et al., 2015 | 25 (88) | 24.4 (4.1) | 0 | 1.4 (1.4) | NA | NA | NA | NA | 24 (79.17) | 24.4 (3.9) |
| Heckers et al., 2004 | 19 (100) | 46.8 (7.2) | NA | NA | 64.6 (12.5) | NA | NA | NA | 15 (100) | 46.6 (9.1) |
| Hong et al., 2011 | 20 (90) | 36.2 (10.4) | 100 | NA | NA | NA | NA | NA | 24 (75) | 35 (10.9) |
| Hugdahl et al., 2004 | 12 (50) | 32.4 (8) | 100 | 8.7 (8.2) | 58.2 (24.3) | NA | NA | NA | 12 (41.67) | 31 (5.5) |
| Hutcheson et al., 2012 | 28 (71.43) | 36.7 (12.2) | NA | 15.9 (11.9) | NA | NA | NA | NA | 28 (60.71) | 35.6 (11.1) |
| Jacob et al., 2019 | 24 (75) | 41.3 (13.5) | NA | NA | NA | NA | NA | NA | 25 (72) | 33.1 (13.6) |
| Jamadar et al., 2010 | 11 (72.73) | 36.75 (8.41) | 100 | NA | NA | NA | NA | NA | 11 (72.73) | 37.42 (8.17) |
| Jamadar et al., 2013 | 74 (79.73) | 36.35 (1.4) | 59.46 | NA | NA | NA | NA | NA | 133 (51.13) | 32.48 (1.05) |
| Jeong et al., 2005 | 10 (30) | 29.2 (10.3) | 100 | 4.3 (4.4) | 58.4 (NA) | 13.2 (2.6) | 15.9 (2.9) | 29.3 (7) | 10 (20) | 30.3 (6.4) |
| Jia et al., 2020 | 38 (60.53) | 22.6 (8.3) | 100 | 3.13 (3.99) | 54.6 (12.9) | 13.2 (5.6) | 14.1 (6.4) | 27.2 (5.4) | 38 (52.63) | 23 (4.6) |
| Jiménez et al., 2010 – Female sample | 17 (100) | 32.11 (7.76) | 100 | 12.88 (7.82) | 76.33 (9.64) | NA | NA | NA | 17 (100) | 32.38 (7.69) |
| Jiménez et al., 2010 – Male sample | 16 (100) | 33.17 (7.72) | 100 | 10.66 (7.55) | 83.23 (29.41) | NA | NA | NA | 18 (100) | 31.64 (6.5) |
| John et al., 2011 | 24 (66.67) | 30.13 (9.48) | 62.5 | 2.57 (1.49) | 54.5 (16.45) | 13.96 (6.03) | 15.29 (7.36) | 25.21 (7.62) | 24 (79.17) | 27.42 (6.27) |
| Johnson et al., 2006 | 18 (88.89) | 36.9 (11.2) | 100 | NA | NA | NA | NA | NA | 18 (83.33) | 37.4 (11.5) |
| Joyal et al., 2007 | 12 (100) | NA (NA) | NA | NA | NA | NA | NA | NA | 12 (100) | NA (NA) |
| Kaladjian et al., 2011 | 26 (80.77) | 35.6 (9.6) | 100 | 13.9 (9.6) | 69.2 (12.6) | 17.8 (5.1) | 20.7 (7) | 29.7 (9.4) | 30 (73.33) | 34 (11.1) |
| Kang et al., 2011 | 12 (83.33) | 45.4 (11.3) | 100 | 22 (10.15) | NA | NA | NA | NA | 11 (72.73) | 44 (7.9) |
| Karch et al., 2009 | 61 (73.77) | 38.4 (9.21) | 93.44 | 13.1 (7.59) | 41.6 (NA)\* | 10.4 (4.37) | 10.3 (4.08) | 20.9 (5.08) | 61 (73.77) | 38.8 (10.09) |
| Kerns et al., 2005 | 13 (61.54) | 35.6 (8.9) | 100 | NA | NA | NA | NA | NA | 13 (69.23) | 36 (4.6) |
| Kim et al., 2010 | 12 (58.33) | 40.2 (10.23) | 100 | 14.1 (9.9) | NA | NA | NA | NA | 13 (61.54) | 40.4 (9.34) |
| Kindermann et al., 2004 | 10 (50) | 58 (7.73) | 100 | 21.1 (8.98) | NA | 11.4 (4.14) | 16.4 (2.93) | NA | 12 (66.67) | 63.8 (10.19) |
| Kircher et al., 2008 | 12 (100) | 26.83 (11.68) | 100 | NA | NA | NA | NA | NA | 12 (100) | 26.5 (7.26) |
| Koch et al., 2009 | 55 (69.09) | 28.4 (NA) | 100 | NA | 68.7 (NA)\* | 15.8 (7.3) | 17.5 (6.6) | 35.4 (13.2) | 55 (67.27) | 26.9 (NA) |
| Koeda et al., 2006 | 14 (85.71) | 31.6 (7) | 92.86 | 9.6 (9.7) | NA | NA | NA | NA | 14 (71.43) | 29.1 (7.8) |
| Köhler et al., 2019 | 29 (65.52) | 33.1 (8.02) | 100 | 9.9 (NA)\* | NA | NA | NA | NA | 28 (64.29) | 33.14 (8.46) |
| Kuperberg et al., 2008 | 16 (75) | 45.9 (8) | 100 | 20.3 (7.7) | NA | 10.8 (6.1) | 16.9 (8.4) | NA | 16 (68.75) | 44.4 (5.9) |
| Landin-Romero et al., 2015 | 28 (75) | 35.71 (9.72) | 100 | 15.66 (8.18) | 66.19 (14.96) | NA | NA | NA | 56 (67.86) | 36.58 (9.87) |
| Laurens et al., 2003 | 10 (90) | 32.9 (12.9) | 100 | 11 (3.1) | NA | NA | NA | NA | 16 (75) | 32.3 (10.6) |
| Ledoux et al., 2013 | 21 (76.19) | 32.05 (1.08) | NA | 11.38 (4.93) | 64 (13) | 15.14 (4.33) | 18.14 (5.68) | 30.71 (6.93) | 22 (72.73) | 30.45 (1.25) |
| Lee et al., 2015a | 28 (82.14) | 41.25 (9.64) | NA | NA | NA | NA | NA | NA | 17 (82.35) | 37.9 (12.9) |
| Lee et al., 2015b | 20 (50) | 37.1 (6.5) | 100 | 11.6 (5.1) | 52.5 (NA)\* | 12.4 (4.6) | 13 (4.7) | 27.1 (7.6) | 20 (50) | 36.7 (7.1) |
| Lepage et al., 2010 | 15 (67) | 34 (8.4) | 93.33 | 10.3 (7.3) | 45.4 (NA)\* | 11.3 (3) | 10 (3.1) | 24.1 (5.3) | 18 (56) | 28.9 (9.5) |
| Li et al., 2019 | 20 (65) | 23.05 (6) | 95 | 2.63 (2.1) | 56.7 (11.2) | 9.75 (3.75) | 18.95 (4.55) | 28 (6.94) | 24 (66.67) | 24.08 (4.34) |
| Lopez-Garcia et al., 2016 | 15 (80) | 39.33 (12.96) | 100 | 16.63 (11.12) | 50 (NA)\* | 11 (4.14) | 15 (6.55) | 24 (8.25) | 20 (40) | 32.7 (11.21) |
| Matsuo et al., 2013 | 46 (50) | 31.5 (7) | 100 | 7.7 (5.2) | 53.82 (NA)\* | 12.04 (4.3) | 14.61 (5.4) | 27.17 (9) | 46 (50) | 31.9 (9.8) |
| McIntosh et al., 2008 | 24 (58.3) | 37 (10.1) | 100 | NA | NA | 10.6 (2.8) | NA | NA | 37 (51.4) | 37.3 (12.1) |
| Meisenzahl et al., 2006 | 12 (91.67) | 33.5 (9.39) | 100 | 29.08 (11.12) | 54.6 (15.57) | NA | NA | NA | 12 (91.67) | 33.58 (9.27) |
| Mendrek et al., 2005 | 12 (75) | 28.75 (9.13) | 100 | NA | NA | NA | NA | NA | 12 (75) | 27.75 (7.48) |
| Moran et al., 2018 | 13 (69.23) | 37.3 (8.1) | 92.31 | NA | NA | NA | NA | NA | 12 (50) | 38.8 (10.7) |
| Moser et al., 2018 | 92 (75) | 27 (7.6) | 100 | 21.5 (5.3) | NA | NA | NA | NA | 48 (58.33) | 29.8 (8.5) |
| Nejad et al., 2011 | 23 (78.26) | 26.18 (5.02) | 43.48 | NA | 82.96 (14.71) | 19.52 (3.94) | 22.91 (6.48) | 40.52 (9.01) | 35 (68.57) | 26.84 (5.82) |
| Nielsen et al., 2017 | 17 (58.82) | 23.71 (6.89) | 100 | 0.78 (0.4) | NA | NA | NA | NA | 18 (50) | 24.94 (7.29) |
| Oertel et al., 2019 | 27 (66.67) | 37.22 (9.14) | 100 | 10.87 (7.73) | 65.42 (15.15) | 16.82 (4.95) | 16.28 (5.88) | 32.32 (7.29) | 27 (37.04) | 34.22 (11.38) |
| Ortiz-Gil et al., 2011 | 18 (77.78) | 40.49 (10.58) | 100 | 18.44 (10.86) | 67.89 (18.33) | NA | NA | NA | 34 (76.47) | 40.9 (11.8) |
| Overbeek et al., 2019 | 21 (76.19) | 23.2 (4.4) | 100 | NA | NA | NA | NA | NA | 21 (76.19) | 23.5 (4.5) |
| Papagni et al., 2011 | 40 (82.5) | 35.22 (11.5) | 100 | 12.23 (9.54) | NA | NA | NA | NA | 48 (50) | 34.35 (10.57) |
| Pae et al., 2008 | 12 (66.67) | 27.8 (7.3) | 100 | 3.5 (NA)\* | NA | NA | NA | NA | 11 (72.72) | 24.6 (6.6) |
| Panagiotaropoulou et al., 2019 | 30 (83.33) | 29.6 (7.7) | 100 | 8.5 (6.6) | NA | NA | NA | NA | 30 (76.67) | 27.8 (7.7) |
| Paulus et al., 2002 | 15 (NA) | 41.7 (1.6) | 60 | 15.7 (2.1) | NA | NA | NA | NA | 15 (NA) | 41 (2.1) |
| Pedersen et al., 2012 | 21 (47.62) | 26.8 (6.5) | 90.48 | 2.18 (2.02) | 59.7 (15.7) | 12.2 (4.8) | 15.6 (4.6) | 30.9 (9.6) | 25 (60) | 31.2 (8.2) |
| Perlstein et al., 2001 | 17 (64.7) | 36.5 (7.5) | 100 | 13.9 (8.4) | NA | NA | NA | NA | 16 (62.5) | 36.5 (6.9) |
| Perlstein et al., 2003 | 16 (68.75) | 36.8 (1.9) | 100 | 14.1 (2.2) | NA | NA | NA | NA | 15 (60) | 36.4 (1.8) |
| Phillips et al., 2015 | 32 (78.13) | 24.7 (NA) | 81.25 | NA | NA | NA | NA | NA | 23 (52.17) | 21.3 (NA) |
| Pomarol-Clotet et al., 2008 | 32 (65.63) | 41.56 (8.79) | 100 | 21.79 (9.09) | NA | NA | NA | NA | 32 (65.63) | 41.03 (11.04) |
| Poppe et al., 2016 | 47 (74.47) | 35.6 (12.1) | 97.87 | NA | NA | NA | NA | NA | 56 (75) | 34.8 (11.9) |
| Prata et al., 2009 | 42 (83.33) | 35.5 (11.4) | 88.1 | 12.2 (9.5) | NA | NA | NA | NA | 48 (47.92) | 34.1 (10.7) |
| Pu et al., 2016 | 35 (51.43) | 21.8 (1.6) | 100 | 0.64 (0.38) | NA | NA | NA | NA | 30 (50) | 21.2 (4.5) |
| Quidé et al., 2013 | 28 (57.14) | 43.86 (9.75) | 100 | NA | 55.79 (16.49) | 14.18 (4.93) | 14.54 (6.72) | 27.11 (8.11) | 28 (50) | 32.96 (10.97) |
| Quidé et al., 2017 | 50 (56) | 41.26 (11.64) | NA | 16.63 (10.4) | 57.82 (17.79) | 14.28 (6.16) | 14.98 (5.63) | 28.56 (9.23) | 47 (53.19) | 38.58 (10.8) |
| Ragland et al., 2006 | 13 (84.62) | 35.2 (8.2) | 100 | 14.6 (9.4) | NA | NA | NA | NA | 13 (92.3) | 31.1 (6.7) |
| Ragland et al., 2012 | 20 (75) | 26.5 (7.4) | 90 | NA | NA | NA | NA | NA | 19 (63.16) | 27.6 (5.9) |
| Ragland et al., 2015 | 52 (76.92) | 33.8 (11.8) | 92.31 | NA | NA | NA | NA | NA | 57 (71.93) | 33.6 (11.5) |
| Rametti et al., 2009 | 22 (50) | 31.7 (6.61) | 100 | 10 (5.74) | 65.9 (17.3) | 12.2 (4.8) | 21 (5.9) | 32.5 (9.6) | 24 (50) | 31.7 (7.04) |
| Rausch et al., 2014 | 23 (69.57) | 33.17 (9.11) | 100 | 7.48 (6.8) | 63.57 (13.11) | 13.7 (4.26) | 16.91 (4.78) | 32.96 (7.55) | 28 (53.57) | 35.79 (12.08) |
| Reid et al., 2010 | 14 (78.57) | 35.1 (12.6) | 100 | NA | NA | NA | NA | NA | 18 (61.11) | 36.8 (12) |
| Reiss et al., 2006 | 10 (90) | 29.1 (9.4) | 100 | 11.5 (12) | 69 (8.2) | NA | NA | NA | 10 (90) | 26.1 (7.1) |
| Rowland et al., 2010 | 17 (52.94) | 41.9 (11) | 100 | NA | NA | NA | NA | NA | 17 (52.94) | 40.8 (13.2) |
| Royer et al., 2009 | 19 (NA) | 33 (6.9) | 100 | NA | NA | NA | NA | NA | 12 (NA) | 33.9 (7.3) |
| Salgado-Pineda et al., 2004 | 14 (50) | 25.05 (4.05) | 100 | NA | NA | NA | NA | NA | 14 (NA) | 25.14 (3.32) |
| Salgado-Pineda et al., 2016 | 27 (81.48) | 36.62 (9.35) | 100 | 14.6 (9) | 59.58 (11.85) | 12 (3.2) | 16.12 (4.34) | 31.46 (NA)\* | 32 (81.25) | 36.52 (7.26) |
| Salgado-Pineda et al., 2018 | 32 (65.63) | 41.56 (8.79) | 100 | 21.79 (9.09) | 71.97 (17.01) | 17.07 (5.88) | 19.14 (7.35) | 31.61 (8.86) | 32 (65.63) | 41.03 (11.04) |
| Sapara et al., 2014 | 14 (64.29) | 37.7 (NA) | 100 | 15.34 (NA)\* | 67.29 (14.53) | 15.71 (4.75) | 19.29 (5.65) | 32.29 (6.33) | 20 (75) | 31.95 (7.6) |
| Satterthwaite et al., 2010 | 16 (62.5) | 37.6 (8.5) | 87.5 | 15.3 (11) | NA | NA | NA | NA | 21 (47.62) | 39 (10.6) |
| Scheuerecker et al., 2008 | 23 (82.6) | 31.6 (11.1) | 86.96 | 3.2 (NA)\* | NA | 21.7 (8.05) | 28.1 (6.5) | NA | 23 (82.6) | 32.6 (9.9) |
| Schlagenhauf et al., 2008 | 10 (80) | 34.6 (12.9) | 100 | 7.6 (9.37) | 69.4 (15.37) | 15.9 (4.09) | 20.3 (8.69) | 33.2 (NA)\* | 10 (80) | 33.8 (12.5) |
| Shafritz et al., 2019 | 33 (78.79) | 22.03 (4.94) | 69.7 | 2.13 (NA)\* | NA | NA | NA | NA | 33 (78.79) | 22.1 (4.8) |
| Sheffield et al., 2018 | 29 (75.86) | 37.79 (12.47) | 100 | NA | NA | NA | NA | NA | 31 (74.19) | 34.69 (10.47) |
| Simons et al., 2010 | 15 (100) | 34.7 (8.7) | 100 | 11.2 (NA) | 48.5 (16.5) | NA | NA | NA | 12 (100) | 34.4 (7.9) |
| Stäblein et al., 2019 | 25 (68) | 36.76 (9.41) | 96 | 15.35 (8.03) | 65.65 (15.45) | 16.91 (4.94) | 16.13 (6.24) | 32.61 (7.71) | 25 (48) | 34.88 (10.53) |
| Stolz et al., 2012 | 22 (50) | 28.35 (8.76) | 100 | 4.28 (3.53) | 50.09 (37.04) | 11.36 (8.82) | 14.59 (10.68) | 24.14 (NA)\* | 28 (32.14) | 26.92 (6.91) |
| Tamminga et al., 2012 | 24 (75) | 40.53 (9.51) | 62.96 | NA | 83.74 (12.38) | 22.94 (4.6) | 19.15 (4.1) | 41.58 (7.4) | 18 (27.8) | 40.3 (11.2) |
| Tan et al., 2005 | 11 (45.45) | 25 (5.5) | 100 | 0.2 (0.26) | 56.1 (13.7) | 10.2 (2.7) | 17.5 (6.2) | 28.4 (8.2) | 11 (45.45) | 25.9 (6.4) |
| Ungar et al., 2010 | 15 (100) | 43 (7) | 100 | 21.3 (NA)\* | NA | NA | NA | NA | 15 (100) | 43 (6) |
| Van Snellenberg et al., 2016 | 51 (54.9) | 35.08 (8.95) | 58.82 | 14.57 (NA)\* | 58.22 (NA)\* | 13.58 (6.3) | 15.25 (5.92) | 29.4 (8.2) | 45 (46.67) | 34 (8.9) |
| Vinckier et al., 2014 | 13 (NA) | 31.7 (7.1) | 69.23 | 0.48 (0.37) | NA | 10.6 (2.7) | 18 (5.4) | NA | 16 (62.5) | 31.1 (6.6) |
| Wadehra et al., 2013 | 12 (75) | 26 (5) | 100 | NA | 50 (12) | 10 (4) | 14 (7) | 25 (6) | 10 (50) | 22 (5) |
| Wagner et al., 2015 | 38 (65.79) | 35.8 (9.9) | 100 | 8.9 (NA)\* | NA | NA | NA | NA | 40 (67.5) | 33.3 (8.6) |
| Walter et al., 2003 | 15 (53.33) | 28.7 (6.8) | 93.33 | 5.5 (6) | NA | 19.4 (8.2) | 23.8 (7.9) | NA | 15 (53.33) | 29.8 (7.3) |
| Walter et al., 2007 | 15 (66.67) | 33.1 (6.5) | 93.33 | 6.1 (5.3) | 64.4 (16.4) | NA | NA | NA | 17 (52.94) | 30.9 (8.8) |
| Weinstein et al., 2006 | 12 (58.33) | 35.9 (12.6) | 100 | 11.6 (NA)\* | NA | NA | NA | NA | 11 (63.64) | 34 (12) |
| Weiss et al., 2003 | 13 (100) | 32.7 (5.9) | 100 | 6.23 (4.7) | 48.9 (12.1) | 11.4 (5.9) | 14.2 (5) | 23.3 (NA)\* | 13 (100) | 30 (5.6) |
| Weiss et al., 2009 | 18 (66.67) | 42.5 (9.9) | 94.44 | 15.6 (11.4) | NA | NA | NA | NA | 18 (61.11) | 43.2 (8.7) |
| Wilmsmeier et al., 2010 | 36 (55.56) | 27.6 (7.4) | 94.44 | 3.58 (5.08) | 59.3 (13.7) | 11.6 (4.1) | 16 (4.7) | 31.4 (8.4) | 28 (53.57) | 30.7 (8) |
| Wolf et al., 2011 | 26 (54) | 38 (10.7) | 96.15 | NA | NA | NA | NA | NA | 25 (52) | 38 (10.3) |
| Wu et al., 2017 | 45 (53.33) | 24.16 (5.2) | NA | 3.42 (NA)\* | 84.2 (9.78) | NA | NA | NA | 45 (53.33) | 24.07 (4.83) |
| Yang et al., 2020 | 44 (75) | 36.86 (9.07) | NA | NA | NA | NA | NA | NA | 44 (75) | 36.73 (9) |
| Yoo et al., 2005 | 10 (80) | 24.9 (4.8) | 100 | 1.7 (NA)\* | NA | NA | NA | NA | 10 (80) | 22.6 (1.4) |
| Yoon et al., 2013 | 18 (66.67) | 33.1 (10.7) | 100 | NA | NA | NA | NA | NA | 19 (57.89) | 28.8 (7.3) |
| Zhou et al., 2018 | 40 (52.5) | 23.4 (4.22) | 100 | 2.19 (1.7) | 82.91 (NA)\* | 22.55 (3.59) | 19.23 (5.2) | 41.13 (6.41) | 62 (56.45) | 23.58 (4.9) |
| Zierhut et al., 2010 | 11 (63.64) | 29 (10.98) | 100 | 6.09 (NA)\* | 79.91 (23.58) | NA | NA | NA | 13 (53.85) | 25 (4.67) |

Abbreviations: SD, standard deviation; PANSS, The Positive and Negative Syndrome Scale; NA, not available. \*Duration of illness calculated based on reported age and age of onset; PANSS Total/subscales’ score calculated based on the reported scores on the other 3.

**Supplementary Table 3.** Description of the 86 functional magnetic resonance imaging data-sets included in the social cognitive meta-analysis.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Study** | **Clinical sample** | | | | | | | | **Control sample** | |
| **N (% male)** | **Age, y, Mean (SD)** | **Medication, % medicated** | **Illness duration, y, Mean (SD)** | **PANSS Total, Mean (SD)** | **PANSS Pos, Mean (SD)** | **PANSS Neg, Mean (SD)** | **PANSS Gen, Mean (SD)** | **N (% male)** | **Age, y, Mean (SD)** |
| Anticevic et al., 2011b | 28 (78.57) | 36.39 (9.54) | 100 | NA | NA | NA | NA | NA | 24 (75) | 37.18 (7.59) |
| Baas et al., 2008 | 12 (83.33) | 28.7 (5.7) | 100 | 6.7 (5.1) | 45 (9.3) | 10.8 (3.2) | 12.7 (4.2) | 21.7 (9.3) | 21 (80.95) | 31.2 (9.7) |
| Becerril and Barch, 2011 | 38 (65.79) | 36.66 (9.12) | 100 | 17.4 (11.2) | NA | NA | NA | NA | 32 (65.63) | 36.19 (10.86) |
| Bliksted et al., 2019 | 17 (70.59) | 23.94 (NA) | 94.12 | NA | NA | NA | NA | NA | 17 (70.59) | 23.59 (NA) |
| Derntl et al., 2012 | 15 (66.67) | 34.2 (9.1) | 100 | 7.3 (5.3) | 52 (7.8) | 12.3 (3.8) | 14.6 (3.7) | 24.5 (4.4) | 15 (66.67) | 30.4 (8.9) |
| Diaz et al., 2011 | 11 (90.9) | 32.57 (12.7) | 100 | 13.7 (14.52) | 66.4 (15.33) | 15 (4.22) | 18 (6.15) | 33.4 (6.57) | 17 (41.18) | 24.01 (3.89) |
| Dietz et al., 2020 | 24 (70.83) | 25.21 (NA) | 100 | NA | NA | NA | NA | NA | 25 (56) | 24.6 (NA) |
| Dzafic et al., 2018 | 16 (56.25) | 45.94 (9.3) | 93.75 | NA | NA | NA | NA | NA | 16 (56.25) | 45.19 (7.93) |
| Ebisch et al., 2013 | 24 (66.67) | 27.3 (4.8) | 95.83 | 0.67 (0.42) | 48.9 (NA)\* | 13.3 (3.4) | 12 (4.5) | 23.6 (5) | 22 (54.55) | 27.5 (3.3) |
| Ferri et al., 2014 | 22 (63.64) | 27.45 (5.07) | 100 | 0.63 (0.42) | 46.94 (NA)\* | 12.54 (4.17) | 12.04 (5.34) | 22.36 (6.85) | 22 (54.55) | 28 (3.77) |
| Fuentes-Claramonte et al., 2020 | 23 (69.57) | 37 (8.06) | 100 | NA | 69 (18.19) | 16.04 (5.49) | 19.74 (5.79) | 33.22 (9.08) | 27 (62.96) | 38.74 (10.2) |
| Furuichi et al., 2019 | 15 (53.33) | 27 (5.3) | 100 | 4.9 (6.1) | NA | NA | NA | NA | 15 (53.33) | 27.5 (4.3) |
| Gilleen et al., 2015 | 20 (100) | 36.5 (6.9) | 95 | NA | 57.5 (15.2) | 15.8 (7.3) | 13.7 (5.6) | 28.1 (6.3) | 12 (100) | 30.7 (7.3) |
| Gradin et al., 2012 | 13 (84.62) | 41.23 (11.78) | 100 | NA | 46.69 (11.92) | 13.23 (2.39) | 12.31 (5.88) | 22.23 (6.86) | 16 (43.75) | 40.87 (11.72) |
| Guimond et al., 2018 | 20 (60) | 26.9 (7.63) | 100 | 4.37 (2.39) | NA | NA | NA | NA | 20 (75) | 25.05 (4.05) |
| Habel et al., 2010 | 14 (100) | 37.14 (8.81) | 85.71 | 9.66 (7.9) | 84.5 (NA)\* | 19.42 (6.86) | 23.5 (9.52) | 41.58 (13.06) | 14 (100) | 35.5 (9.31) |
| Harvey and Lepage, 2014 | 28 (60.71) | 31 (8.8) | 100 | 9.7 (NA)\* | NA | NA | NA | NA | 26 (50) | 30.7 (9.8) |
| Hashimoto et al., 2014 | 17 (52.94) | 31.1 (6.2) | 100 | 7.1 (6.1) | 72.9 (NA)\* | 15.2 (5.3) | 20.3 (6) | 37.4 (7.2) | 17 (76.47) | 27.7 (4.3) |
| Herold et al., 2018 | 12 (50) | 36.88 (7.99) | 100 | 10 (6.74) | 65.7 (13.45) | 14 (4) | 18.02 (5.47) | 34.15 (7.3) | 12 (41.67) | 37 (9.08) |
| Horan et al., 2016 | 21 (71.4) | 48.2 (10.4) | 100 | 26.1 (12.2) | NA | NA | NA | NA | 21 (66.7) | 46.5 (7.1) |
| Huang et al., 2016 | 23 (86.96) | 34.48 (8.24) | 100 | 11.26 (8.2) | 65.04 (NA)\* | 10.3 (3.9) | 23.61 (3.5) | 31.13 (7.68) | 23 (65.22) | 34.91 (6.69) |
| Iwashiro et al., 2019 | 15 (53.33) | 29.9 (8.9) | NA | 6.37 (7.75) | 69.3 (NA)\* | 15.4 (4.8) | 18.6 (8.5) | 35.3 (9.7) | 23 (65.22) | 28.5 (4.3) |
| Jimenez et al., 2018 | 20 (65) | 48.3 (9.9) | 90 | NA | NA | NA | NA | NA | 16 (68.75) | 44.69 (11.1) |
| Kang et al., 2009 | 14 (50) | 30.4 (3.7) | 100 | 6.7 (3.3) | 62.1 (7.3) | 13.8 (2.3) | 16.1 (1.7) | 32.2 (4.3) | 28 (50) | 29.9 (2.9) |
| Karpouzian et al., 2017 | 15 (53.33) | 34.78 (5.64) | NA | 11.55 (6.79) | NA | NA | NA | NA | 23 (56.52) | 34.44 (9.04) |
| Kim et al., 2015 | 15 (46.67) | 28.4 (8) | 100 | 6.8 (4.5) | 69.1 (NA)\* | 15.4 (4.9) | 18.1 (5.4) | 35.6 (5.9) | 15 (46.67) | 29.7 (5.3) |
| Kim et al., 2018 | 20 (45) | 34.6 (9.5) | 100 | NA | 105.85 (10.3) | 23.45 (2.54) | 28.15 (4.43) | 54.25 (5.44) | 20 (60) | 35.6 (6.79) |
| Kumari et al., 2010 | 20 (75) | 35.1 (7.59) | 100 | 10.74 (8.06) | NA | NA | NA | NA | 20 (70) | 33.95 (10.37) |
| Knolle et al., 2018 | 14 (57.14) | 23.85 (6.3) | 0 | NA | NA | 2.2 (0.7) | NA | NA | 34 (52.94) | 22.85 (3.3) |
| Larabi et al., 2018 | 35 (74.29) | 35 (10.16) | 94.29 | 11.1 (8.6) | 57.9 (14.71) | 14.47 (5.47) | 14.27 (4.61) | 29.17 (7.73) | 16 (62.5) | 33.6 (11.11) |
| Lee et al., 2010 | 15 (46.67) | 26 (4.3) | 100 | 4.6 (3.4) | 59.1 (13.5) | 13.1 (5.1) | 15.4 (4.1) | 30.6 (6.8) | 18 (50) | 25.8 (2.2) |
| Lee et al., 2011 | 12 (83.33) | 38.3 (10.7) | NA | NA | NA | NA | NA | NA | 13 (76.92) | 42.5 (7.7) |
| Lee et al., 2014 | 15 (66.67) | 30.7 (6.6) | 100 | 7.7 (5.3) | 60.5 (NA)\* | 16.2 (3.7) | 15.4 (4.3) | 28.9 (4.2) | 16 (56.25) | 27.4 (6.9) |
| Lee S. K. et al., 2014 | 15 (53.33) | 31.7 (6.8) | 100 | 10.3 (6.9) | 56.5 (12.1) | 13.4 (4.2) | 15.8 (5.3) | 27.3 (7.5) | 14 (42.86) | 30.6 (5.5) |
| Lee J. S. et al., 2014 | 15 (60) | 36.7 (8.1) | 100 | 10.9 (7.3) | 24.4 (6.1) | 9.7 (2.8) | 12.6 (3.4) | 2.1 (NA)\* | 16 (62.5) | 36.8 (6.3) |
| Lee et al., 2016 | 15 (NA) | 38.4 (10.3) | 100 | NA | NA | NA | NA | NA | 14 (NA) | 41.8 (7.4) |
| Lee et al., 2019 | 27 (58) | 45.8 (10.3) | 100 | 23.7 (NA)\* | NA | NA | NA | NA | 25 (68) | 47.2 (9.2) |
| Lindner et al., 2016 | 36 (63.89) | 30.6 (8) | 100 | 6.7 (5.6) | NA | NA | NA | NA | 40 (67.5) | 29.5 (8.3) |
| Makowski et al., 2016 | 15 (73.33) | 33.1 (7.7) | NA | 11.7 (NA)\* | NA | NA | NA | NA | 15 (60) | 35.2 (9.8) |
| Mier et al., 2010 | 16 (68.75) | 34.25 (6.95) | 100 | NA | NA | NA | NA | NA | 16 (68.75) | 37 (8.18) |
| Mier et al., 2014 | 11 (63.64) | 32.45 (7.66) | 100 | 10.18 (8.92) | NA | NA | NA | NA | 16 (68.75) | 34.5 (6.47) |
| Mier et al., 2017 | 22 (18.18) | 38.05 (9.19) | 100 | 10.5 (6.84) | 32.59 (7.14) | 14.32 (3.87) | NA | NA | 22 (27.27) | 37.5 (10.82) |
| Morris et al., 2012 | 12 (66.67) | 44 (3) | 100 | NA | 73 (NA)\* | 19 (2) | 22 (2) | 32 (2) | 15 (40) | 35 (2) |
| Moser et al., 2018 | 92 (75) | 27 (7.6) | 100 | 5.5 (NA)\* | NA | NA | NA | NA | 48 (58.33) | 29.8 (8.5) |
| Mothersill et al., 2014 | 25 (80) | 42.88 (10.99) | 100 | NA | NA | NA | NA | NA | 21 (76.19) | 38.24 (8.62) |
| Mucci et al., 2015 | 28 (64.29) | 33.1 (6.67) | NA | NA | NA | 8.04 (4.13) | 11.64 (6.87) | NA | 22 (45.45) | 31.91 (8.49) |
| Mukerji et al., 2018 | 19 (52.63) | 38.1 (9.56) | NA | 16.66 (11.83) | NA | 16.37 (5.74) | 13.05 (5.47) | NA | 24 (75) | 35.38 (11.37) |
| Mukherjee et al., 2014 | 20 (60) | 37.5 (8.2) | 100 | NA | 50.8 (NA)\* | 12.3 (4.5) | 15.8 (4.2) | 22.7 (5.1) | 24 (66.67) | 35.13 (9.7) |
| Murphy et al., 2010 | 11 (63.64) | 26.7 (6.36) | NA | 3.36 (4.82) | NA | NA | NA | NA | 10 (40) | 29.6 (8.4) |
| Oh et al., 2015 | 16 (50) | 29.8 (5.3) | 100 | 6.6 (6.2) | 73.1 (NA)\* | 17.6 (8.9) | 17.7 (6.8) | 37.8 (13.2) | 16 (50) | 30.7 (2.9) |
| Park et al., 2009 | 15 (NA) | NA (NA) | 100 | NA | NA | 13.1 (2.4) | 17.1 (4.2) | NA | 16 (NA) | NA (NA) |
| Park et al., 2018 | 17 (41.18) | 27.2 (7.3) | 100 | NA | 56.5 (16.8) | 13.4 (3.9) | 16.2 (3.7) | 29.9 (6.1) | 20 (45) | 26.1 (5.1) |
| Park et al., 2019 | 17 (52.94) | 31.1 (9) | 100 | 8.5 (5.9) | 72.7 (18) | 16.5 (5.7) | 19.5 (6.6) | 36.7 (6.8) | 17 (52.94) | 32.8 (8.6) |
| Pauly et al., 2014 | 13 (53.85) | 36.23 (9.46) | 100 | 12 (6.93) | NA | NA | NA | NA | 13 (53.85) | 34.46 (8.58) |
| Pedersen et al., 2012 | 15 (60) | 29 (8.2) | 100 | 5.55 (6.3) | 55.9 (12.2) | 10.9 (2.8) | 14.9 (5.4) | 30.1 (6.5) | 14 (64.29) | 29.9 (8.8) |
| Pinkham et al., 2011 | 35 (48.57) | 36.46 (10.71) | 100 | 15.21 (11.06) | NA | NA | NA | NA | 37 (48.65) | 35.59 (9.93) |
| Pinkham et al., 2018 | 31 (58.06) | 35.65 (7.52) | 87.1 | NA | 60.25 (NA)\* | 17.54 (5.68) | 12.23 (3.2) | 30.48 (6.44) | 32 (62.5) | 35.41 (7.07) |
| Quintana et al., 2011 | 12 (25) | 45 (9.9) | 100 | 17.1 (8.2) | NA | NA | NA | NA | 15 (20) | 40 (9) |
| Rahm et al., 2015 | 28 (75) | 29.9 (7.8) | 82.14 | 4.9 (4.6) | NA | NA | 13.9 (7.4) | NA | 28 (71.43) | 31.5 (8.4) |
| Rapp et al., 2013 | 15 (0) | 28.1 (NA) | 100 | NA | 69.9 (NA) | 17.4 (NA) | 16 (NA) | 36.5 (NA) | 15 (0) | 32.9 (NA) |
| Razafimandimby et al., 2016 | 21 (76.19) | 33.9 (7.4) | 100 | 11.9 (7.9) | 52.5 (NA)\* | 13.6 (5.1) | 12 (4) | 26.9 (5.7) | 25 (76) | 33.1 (7.3) |
| Renes et al., 2016 | 31 (90.32) | 29.4 (7.1) | 90.32 | 9.2 (7.9) | 43.6 (NA)\* | 10.1 (2.7) | 11.8 (4.2) | 21.7 (3.4) | 31 (90.32) | 31.3 (6.5) |
| Reske et al., 2007 | 10 (60) | 37.4 (6.06) | 100 | NA | 50.5 (9.41) | 8.9 (2.69) | 16.1 (3.45) | 25.5 (4.72) | 10 (60) | 35.3 (8.71) |
| Schwarz et al., 2020 | 27 (66.67) | 32.4 (10.4) | NA | NA | 54.6 (16.5) | NA | NA | NA | 110 (49.09) | 30.4 (10.3) |
| Segarra et al., 2016 | 21 (85.71) | 32.24 (7.44) | 100 | NA | NA | NA | NA | NA | 21 (80.95) | 34.33 (10.11) |
| Shad et al., 2012 | 17 (82.35) | 40 (10.3) | NA | 17.88 (5.63) | 64.76 (14.67) | 17.1 (4.6) | 15 (3.7) | 32.7 (8) | 15 (53.33) | 44.3 (9.6) |
| Shin et al., 2015 | 17 (64.71) | 31 (6.1) | 100 | 10.9 (6.9) | 67 (NA)\* | 17.1 (3.7) | 17.3 (4.5) | 32.6 (8.4) | 19 (63.16) | 28.21 (4.2) |
| Singh et al., 2015 | 14 (78.57) | 31.5 (9.4) | 100 | 10.03 (6.96) | NA | NA | NA | NA | 14 (71.43) | 27.21 (4.78) |
| Smith et al., 2015 | 30 (60) | 33.6 (7.1) | 100 | 13.6 (7.5) | NA | NA | NA | NA | 24 (58.33) | 34.4 (8.9) |
| Spilka et al., 2015 | 28 (53.57) | 41.07 (11.15) | 100 | 17.18 (NA)\* | 53.68 (11.98) | 12.43 (3.94) | 14.5 (5.27) | 26.75 (6.17) | 27 (48.15) | 40.7 (11.1) |
| Subramaniam et al., 2015 | 37 (67.67) | 45.14 (9.97) | 100 | 25.4 (NA) | NA | NA | NA | NA | 20 (70) | 43.72 (13.32) |
| Subramaniam et al., 2017 | 20 (80) | 41.06 (11.07) | 100 | 18.6 (NA) | NA | NA | NA | NA | 20 (65) | 43.5 (13.17) |
| Surguladze et al., 2006 | 15 (100) | 43.1 (8.8) | 100 | 19.9 (10.5) | NA | NA | NA | NA | 11 (100) | 36.8 (10.6) |
| Surguladze et al., 2011 | 16 (62.5) | 43.7 (9.4) | 100 | 18.6 (9.7) | 40.4 (NA)\* | 10.9 (4.3) | 9.4 (1.7) | 20.1 (3.4) | 16 (50) | 40.4 (12.8) |
| Swart et al., 2013 | 18 (83.33) | 29.44 (5.81) | 88.89 | NA | 52.33 (NA)\* | 13 (4.96) | 13.72 (4.55) | 25.61 (5.34) | 18 (66.67) | 28.44 (8.09) |
| Takahashi et al., 2004 | 15 (66.67) | 29 (6.9) | 73.33 | 4.9 (4.9) | NA | NA | NA | NA | 15 (60) | 29.1 (7.8) |
| Taylor et al., 2011 | 21 (66.67) | 40.7 (9.3) | 100 | 19.5 (12.3) | NA | NA | NA | NA | 21 (71.43) | 39.8 (10.3) |
| Tseng et al., 2016 | 18 (72.22) | 27.72 (5.36) | 55.56 | NA | 54.56 (13.79) | 13.47 (5.29) | 13.17 (5.45) | 27 (7.36) | 21 (38.1) | 22.91 (3.79) |
| van der Meer et al., 2014 | 20 (80) | 35.2 (10.8) | 100 | 10.5 (NA)\* | 59.3 (NA)\* | 14.7 (5.4) | 14.7 (4.1) | 29.9 (7.7) | 20 (70) | 35.5 (11.7) |
| Vanes et al., 2018 | 21 (14) | 41.3 (10.4) | 100 | 14.1 (10.1) | 46.9 (10.3) | 10.7 (2.1) | 13.1 (4.6) | 23.6 (5.1) | 24 (25) | 38.4 (10) |
| Varga et al., 2013 | 21 (42.86) | 37.95 (9.06) | 100 | 11.95 (8.45) | 66.57 (13.83) | 13.81 (3.23) | 17 (5.43) | 34 (7.03) | 24 (41.67) | 33.96 (8.51) |
| Vercammen et al., 2012 | 20 (75) | 34.4 (7.8) | 100 | 12 (7.2) | 67.4 (21.8) | 15.9 (5.9) | 16.1 (7.5) | 35.4 (11.6) | 23 (47.83) | 33.3 (7.1) |
| Vistoli et al., 2017 | 27 (85.19) | 29.7 (8.6) | 88.89 | 7.6 (7.9) | NA | 13.8 (6.5) | 16 (6.3) | NA | 21 (80.95) | 29.2 (7.9) |
| Walter et al., 2009 | 12 (50) | 29.41 (5.96) | NA | 6.3 (5.2) | 73.75 (11.02) | 17.75 (5.06) | 19.41 (3.96) | 36.59 (NA)\* | 12 (50) | 24.75 (2.63) |
| Whalley et al., 2009 | 15 (73.33) | 38.4 (10.2) | 100 | NA | NA | NA | NA | NA | 14 (71.43) | 35.4 (8.4) |
| Williams et al., 2004 | 27 (62.96) | 27.3 (9.6) | 100 | 4.1 (2.8) | 76.62 (NA)\* | 19.7 (NA) | 20.45 (NA) | 36.9 (9.1) | 22 (63.64) | 27.2 (8.1) |

Abbreviations: SD, standard deviation; PANSS, The Positive and Negative Syndrome Scale; NA, not available. \*Duration of illness calculated based on reported age and age of onset; PANSS Total/subscales’ score calculated based on the reported scores on the other 3.

**Supplementary Table 4.** Tasks, contrasts, and corresponding MATRICS subdomains of the 143 functional magnetic resonance imaging data-sets included in the neurocognitive meta-analysis.

|  |  |  |
| --- | --- | --- |
| **Study** | **Task (Contrast)** | **Subdomain** |
| Anticevic et al., 2011 | Stenberg-type WM task (Maintenance) | WM |
| Arce et al., 2006 | Go-NoGo task (NoGo > Go) | AV |
| Backes et al., 2011 | Modified version of the Attention Network Test (Incongruent > Congruent) | PS |
| Barch et al., 2002 | N-Back task (2>0 Back) | WM |
| Becerril et al., 2011 | Non-verbal N-Back task (Error > Correct) | WM |
| Bertolino et al., 2006 | N-Back task (1>0 Back) | WM |
| Boksman et al., 2005 | Verbal fluency task (Generation > Baseline) | VF |
| Bonner-Jackson et al., 2005 | Memory encoding task (Deep > Shallow encoding) | ViLM + VeLM |
| Bor et al., 2011 | N-Back task (Spatial 2>0 Back) | WM |
| Callicott et al., 2000 | N-Back task (Linear 0 – 1 – 2 Back) | WM |
| Chakirova et al., 2011 | Hayling Sentence Completion task (Sentence completion > Baseline)\* | VC |
| Chen et al., 2016 | Prospective memory (PM > Ongoing) | AV |
| Choi et al., 2008 | Latency Stroop task | PS |
| Choi et al., 2012 | Spatial WM task (Encoding) | WM |
| Cieslik et al., 2013 | Stimulus-response integration (Incongruent) | PS |
| Cohen et al., 2015 | Tower of London task (Linear increase of task difficulty) | EF |
| Collier et al., 2014 | Recognition memory task (Remembered > Forgotten)\* | ViLM |
| Costafreda et al., 2011 | Verbal fluency task (Generation > Repetition) | VF |
| Cuervo-Lombard et al., 2012 | Autobiographical memory retrieval task (Autobiographical memory retrieval > Control) | VeLM |
| Dehaene et al., 2003 | Number comparison task (Unmasked Incongruent > Congruent) | PS |
| Dollfus et al., 2008 | Semantic processing task (French > Tamil) | VC |
| Eich et al., 2014 | Verbal WM task (PreCue > PostCue) | WM |
| Eryilmaz et al., 2016 | Sternberg Item Recognition Paradigm (Error > Fixation) | WM |
| Esslinger et al., 2007 | Mental maze task (Maze > PseudoMaze, First > Second) | EF |
| Ettinger et al., 2011 | N-Back task (Group x Load interaction) | WM |
| Eyler et al., 2008 | Verbal paired associates task (New pairs > Fixation) | VeLM |
| Fassbender et al., 2014 | Stroop task (Long > Short) | PS |
| Fatjó-Vilas et al., 2012 | N-Back task (2>1 Back) | WM |
| Folley et al., 2010 | Virtual Morris water-maze task (Hidden > Visible) | EF |
| Fuentes-Claramonte et al., 2020 | N-Back task (2 Back > Baseline) | WM |
| Garrison et al., 2017 | Word-pair reality monitoring task (Reality monitoring > Perceptual motor baseline) | VeLM |
| Geisler et al., 2015 | Sternberg Item Recognition Paradigm (Load 5 > Load 1) | WM |
| Grot et al., 2017 | WM binding task (Encoding) | WM |
| Guerrero-Pedraza et al., 2012 | N-Back task (2>0 Back) | WM |
| Guimond et al., 2017 | Semantic encoding memory task (Self-initiation Good+Poor) | ViLM |
| Guimond et al., 2018 | Emotional WM task (2>0 Back) | WM |
| Guse et al., 2013 | N-Back task (2>0 Back)\* | WM |
| Habel et al., 2010 | N-Back task (2>0 Back) | WM |
| Hall et al., 2010 | Face-name encoding and retrieval task (Late encoding) | ViLM + VeLM |
| Hamilton et al., 2009 | WM task (On > Off) | WM |
| Han et al., 2007 | Lexical-decision semantic-priming paradigm (Linear high – low – unrelated regression) | VC |
| Harrison et al., 2007 | Multi-source interference task (Incongruent > Congruent) | PS |
| Harvey and Lepage, 2014 | Picture recognition memory task (Non-social Old > New) | ViLM |
| Hawco et al., 2015 | Memory task in a virtual environment (Place > Object) | ViLM |
| Heckers et al., 2004 | Multi-source interference task (Interference > Control)\* | PS |
| Hong et al., 2011 | Rapid visual information-processing task (RVIP > Control) | AV |
| Hugdahl et al., 2004 | Mental arithmetic task (Mental arithmetic > Vigilance) | WM |
| Hutcheson et al., 2012 | Episodic memory task (Encoding) | VeLM |
| Jacob et al., 2019 | Picture-word matching task (In-category > Matched, Out of category > Matched, OC vs IC)\* | PS |
| Jamadar et al., 2010 | Switch task (Repeat > Switch) | EF |
| Jamadar et al., 2013 | Semantic Object Retrieval Task (Correct Retrieval > No-retrieval) | VeLM |
| Jeong et al., 2005 | Stroop task (Interference > Facilitation) | PS |
| Jia et al., 2020 | Decision-redecision paradigm (Redecision phase > Control) | EF |
| Jiménez et al., 2010 – Female sample | Mental rotation task (Mental rotation > Control) | EF |
| Jiménez et al., 2010 – Male sample | Mental rotation task (Mental rotation > Control) | EF |
| John et al., 2011 | Verbal fluency task (Generation > Repetition) | VF |
| Johnson et al., 2006 | Sternberg Item Recognition Paradigm (Difficult encoding) | WM |
| Joyal et al., 2007 | Go-NoGo task (Go-NoGo > Reference) | AV |
| Kaladjian et al., 2011 | Go-NoGo task (Correct NoGo > Correct Go) | AV |
| Kang et al., 2011 | Visual object construction (Complex > Simple) | WM |
| Karch et al., 2009 | N-Back task (2>0 Back) | WM |
| Kerns et al., 2005 | Stroop task (Incongruent > Congruent) | PS |
| Kim et al., 2010 | Verbal WM task (Maintenance true trials > Baseline) | WM |
| Kindermann et al., 2004 | Spatial WM task (WM > Active viewing) | WM |
| Kircher et al., 2008 | Semantic verbal fluency task (Generation > Reading)) | VF |
| Koch et al., 2009 | Verbal WM task (Encoding alphabetize > Baseline) | WM |
| Koeda et al., 2006 | Language processing task (Forward > Reversed sentences)\* | VC |
| Köhler et al., 2019 | Stroop task (Incongruent > Congruent)\* | PS |
| Kuperberg et al., 2008 | Semantic processing task (Incongruent > Congruent) | VC |
| Landin-Romero et al., 2015 | N-Back task (2 Back > Baseline) | WM |
| Laurens et al., 2003 | Go-NoGo task (Correct NoGo > Correct Go) | AV |
| Ledoux et al., 2013 | Visuo-spatial navigation task (Experimental task) | EF |
| Lee et al., 2015a | Go-NoGo task (Correct NoGo > Rest) | AV |
| Lee et al., 2015b | Recognition memory task (Recognition Unreal > Real) | ViLM |
| Lepage et al., 2010 | Item recognition task (Old > New) | ViLM |
| Li et al., 2019 | N-Back task (2>0 Back) | WM |
| Lopez-Garcia et al., 2016 | DPX task (Cue B > Cue A) | AV |
| Matsuo et al., 2013 | Verbal WM task (High > Low load) | WM |
| McIntosh et al., 2008 | Hayling Sentence Completion task (Sentence completion > Baseline) | VC |
| Meisenzahl et al., 2006 | N-Back task (2>0 Back) | WM |
| Mendrek et al., 2005 | N-Back task (2>0 Back) | WM |
| Moran et al., 2018 | Stop signal task (Stop correct > Go)\* | AV |
| Moser et al., 2018 | N-Back task (2>0 Back) | WM |
| Nejad et al., 2011 | Verbal N-Back task (2>0 Back)\* | WM |
| Nielsen et al., 2017 | N-Back task (2>0 Back)\* | WM |
| Oertel et al., 2019 | Face-name association task (Encoding > ITI) | ViLM + VeLM |
| Ortiz-Gil et al., 2011 | N-Back task (2 Back > Baseline) | WM |
| Overbeek et al., 2019 | Stroop task (Incongruent > Congruent) | PS |
| Papagni et al., 2011 | Verbal fluency task (Generation > Baseline) | VF |
| Pae et al., 2008 | Verbal N-Back task (2>0 Back) | WM |
| Panagiotaropoulou et al., 2019 | Eriksen flanker task (Incongruent > Congruent)\* | PS |
| Paulus et al., 2002 | Two-choice prediction task (Prediction > Response) | EF |
| Pedersen et al., 2012 | Wisconsin Card Sorting Test (Set-shifting Negative > Positive feedback) | EF |
| Perlstein et al., 2001 | N-Back task (Group x Load interaction) | WM |
| Perlstein et al., 2003 | AX-CPT (Cue B > Cue A) | AV |
| Phillips et al., 2015 | AX-CPT Attention lapses (Lapse > Correct) | AV |
| Pomarol-Clotet et al., 2008 | N-Back task (2>0 Back) | WM |
| Poppe et al., 2016 | DPX task (Cue B > Cue A) | AV |
| Prata et al., 2009 | Verbal fluency task (Generation > Repetition) | VF |
| Pu et al., 2016 | N-Back task (2 Back > Baseline) | WM |
| Quidé et al., 2013 | N-Back task (2 Back > Baseline) | WM |
| Quidé et al., 2017 | N-Back task (2>0 Back)\* | WM |
| Ragland et al., 2006 | Source monitoring task (True positive, correct source > True negative) | VeLM |
| Ragland et al., 2012 | Relational and Item-Specific Encoding task (Reorder > Rehearse) | WM |
| Ragland et al., 2015 | Relational and Item-Specific Encoding task (Relational > Item-specific Encoding) | ViLM |
| Rametti et al., 2009 | Verbal memory recognition task (Recognition > Novel) | VeLM |
| Rausch et al., 2014 | Modified beads task (Lake reasoning > Color naming)\* | EF |
| Reid et al., 2010 | Stroop task (Correct incongruent > Congruent) | PS |
| Reiss et al., 2006 | Serial reaction time task (Implicit learning > Random) | AV |
| Rowland et al., 2010 | Relational learning task (Transverse patterning > Simple discrimination) | ViLM |
| Royer et al., 2009 | N-Back task (2>0 Back) | WM |
| Salgado-Pineda et al., 2004 | CPT (CPT > Control) | AV |
| Salgado-Pineda et al., 2016 | Virtual reality spatial navigation task (Spatial navigation) | EF |
| Salgado-Pineda et al., 2018 | N-Back task (2 Back > Baseline) | WM |
| Sapara et al., 2014 | N-Back task (2>0 Back) | WM |
| Satterthwaite et al., 2010 | Face recognition task (Hit > Correct rejection) | ViLM |
| Scheuerecker et al., 2008 | N-Back task (2>0 Back) | WM |
| Schlagenhauf et al., 2008 | N-Back task (2>0 Back) | WM |
| Shafritz et al., 2019 | Response conflict task (Opposite > Same side) | PS |
| Sheffield et al., 2018 | Rapid instruction-based task learning (Instruction, Practice)\* | WM |
| Simons et al., 2010 | Inner speech task (Inner speech > Listening) | VC |
| Stäblein et al., 2019 | Masked change detection task (Different > Same) | WM |
| Stolz et al., 2012 | Episodic memory task (Retrieval) | ViLM |
| Tamminga et al., 2012 | Novelty detection task (Novel > Familiar)\* | ViLM |
| Tan et al., 2005 | Maintenance and manipulation WM task (Manipulation) | WM |
| Ungar et al., 2010 | Stroop task (Incongruent > Congruent) | PS |
| Van Snellenberg et al., 2016 | Self-ordered WM task (SOT > Control) | WM |
| Vinckier et al., 2014 | Word degradation task (Normal words > Rest)\* | VC |
| Wadehra et al., 2013 | Associative learning task (Encoding) | ViLM |
| Wagner et al., 2015 | Stroop task (Group x Task interaction)\* | PS |
| Walter et al., 2003 | Verbal N-Back task (2>0 Back) | WM |
| Walter et al., 2007 | Cognitive activation task (Load 2 > Control) | WM |
| Weinstein et al., 2006 | Semantic processing task (English > Reversed English, English > Mandarin)\* | VC |
| Weiss et al., 2003 | Adapted Stroop task (Stroop > Rest) | PS |
| Weiss et al., 2009 | Recognition memory task (Old > New) | VeLM |
| Wilmsmeier et al., 2010 | Wisconsin Card Sorting Test (Set-shifting > No shift) | EF |
| Wolf et al., 2011 | Forced-choice visual recognition task (Hits > Misses) | ViLM |
| Wu et al., 2017 | N-Back task (2>0 Back) | WM |
| Yang et al., 2020 | Stop Signal task (Stop > Go)\* | AV |
| Yoo et al., 2005 | N-Back task (2>0 Back) | WM |
| Yoon et al., 2013 | Face WM paradigm (Response phase > Baseline) | WM |
| Zhou et al., 2018 | N-Back task (2>0 Back) | WM |
| Zierhut et al., 2010 | LOP paradigm with free recall (Hits > Misses) | VeLM |

Abbreviations: AV, attention/vigilance; CPT, continuous performance task; DPX, Dot Probe Expectancy; EF, executive function/reasoning and problem solving; LOP, levels of processing; PS, processing speed; VC, verbal comprehension; VeLM, verbal learning and memory; VF, verbal fluency; ViLM, visual learning and memory; WM, working memory. \*Data-set without significant results.

**Supplementary Table 5.** Tasks, contrasts, and corresponding MATRICS subdomains of the 86 functional magnetic resonance imaging data-sets included in the social cognitive meta-analysis.

|  |  |  |
| --- | --- | --- |
| **Study** | **Task** | **Subdomain** |
| Anticevic et al., 2011b | Stenberg-type WM task with emotional distractors (Negative > Neutral) | EP |
| Baas et al., 2008 | Social decision-making task (Trustworthiness during implicit task) | SP |
| Becerril and Barch, 2011 | Emotional N-Back task (Negative > Neutral & Positive) | EP |
| Bliksted et al., 2019 | Animated triangles task (Intentional > Random) | TM |
| Derntl et al., 2012 | Emotional perspective taking (Emotional perspective taking > Rest) | TM |
| Diaz et al., 2011 | WM task with emotional distraction (Emotional > Neutral) | EP |
| Dietz et al., 2020 | Social cognition paradigm from HCP (Social > Non-social)\* | SP |
| Dzafic et al., 2018 | Dynamic emotion perception task (Group x Congruency interaction) | EP |
| Ebisch et al., 2013 | Social perception task (Touch perception > Baseline) | SP |
| Ferri et al., 2014 | Emotion-action paradigm (Angry action > Baseline) | EP |
| Fuentes-Claramonte et al., 2020 | Self-other reflection task (Other > Self-reflection) | AB |
| Furuichi et al., 2019 | Self-reflective processing task (Other (>Button) > Self (>Button)) | AB |
| Gilleen et al., 2015 | Monetary Incentive Delay reward task (Reward anticipation, Reward outcome)\* | EP |
| Gradin et al., 2012 | Social exclusion task (Parametric regressor of social exclusion) | SP |
| Guimond et al., 2018 | Emotional WM task (Fearful 2>0 Back) | EP |
| Habel et al., 2010 | Emotional induction task (Negative > Neutral) | EP |
| Harvey and Lepage, 2014 | Emotional memory task (Social > Non-social information observation) | EP |
| Hashimoto et al., 2014 | Biological motion task (Biological > Scrambled motion) | SP |
| Herold et al., 2018 | Irony comprehension task (Ironic > Control) | TM |
| Horan et al., 2016 | Adapted empathy task (Other > Self) | TM |
| Huang et al., 2016 | Effort-Expenditure for Rewards Task (High > Low reward) | EP |
| Iwashiro et al., 2019 | Emotional dichotic listening task (RightNeg-LeftNeut > Neut-Neut) | EP |
| Jimenez et al., 2018 | Emotion in biological motion task (Emotional > Baseline) | EP |
| Kang et al., 2009 | Auditory emotional processing task (Laugh > Neutral) | EP |
| Karpouzian et al., 2017 | Facial affect perception (Emotion discrimination > Rest) | EP |
| Kim et al., 2015 | Emotional memory task (Encoding + Retrieval of unpleasant words) | EP |
| Kim et al., 2018 | Real-life reward task (Intrinsic > control, Extrinsic > control)\* | EP |
| Kumari et al., 2010 | Verbal monitoring task (Self > Other) | AB |
| Knolle et al., 2018 | Emotional oddball task (Emotional > Neutral) | EP |
| Larabi et al., 2018 | Emotion regulation task (Reappraisal > Attend negative) | EP |
| Lee et al., 2010 | Comic strips task (Inhibitory empathy > Physical causality) | TM |
| Lee et al., 2011 | Belief attribution task (False belief > False photograph) | TM |
| Lee et al., 2014 | Virtual handshake task (Refusal > Acceptance) | SP |
| Lee S. K. et al., 2014 | Emotion judgement task (Emotional > Null) | EP |
| Lee J. S. et al., 2014 | Emotional faces task (Happiness & Sadness > Meaningless expression) | EP |
| Lee et al., 2016 | Emotion attribution task (Other attribution > View)\* | TM |
| Lee et al., 2019 | One-Armed Bandit task (Social reward: High > Low payout)\* | EP |
| Lindner et al., 2016 | Emotional faces task (Unmasked fearful > Neutral) | EP |
| Makowski et al., 2016 | Social approval task (Self > Other) | SP |
| Mier et al., 2010 | Emotion recognition task (Emotion > Baseline) | EP |
| Mier et al., 2014 | Emotion recognition task (Fear) | EP |
| Mier et al., 2017 | Social-cognitive task (TM > Emotional > Neutral) | TM |
| Morris et al., 2012 | Emotion regulation task (Decrease > Maintain) | EP |
| Moser et al., 2018 | Emotional recognition task (Emotional face matching > Shape matching)\* | EP |
| Mothersill et al., 2014 | Face processing task (Angry > Neutral)\* | EP |
| Mucci et al., 2015 | Monetary Incentive Delay reward task (Reward anticipation, Feedback)\* | EP |
| Mukerji et al., 2018 | Simulation task (Pain observation > Control observation)\* | TM |
| Mukherjee et al., 2014 | Approachability judgement task (Approachability > Gender) | SP |
| Murphy et al., 2010 | Self-other reflection task (Self > Other) | AB |
| Oh et al., 2015 | Emotion selection task (Emotion selection > Null) | EP |
| Park et al., 2009 | Emotional attribution task (Angry-Certain > Neutral-Certain) | EP |
| Park et al., 2018 | Simon task (Negative congruent & incongruent) | EP |
| Park et al., 2019 | Face recognition task with fearful distractors (Fearful distractor > Neutral) | EP |
| Pauly et al., 2014 | Self-other evaluation task (Self > Other) | AB |
| Pedersen et al., 2012 | Moving shapes paradigm (TM > Non-TM animations) | TM |
| Pinkham et al., 2011 | Gaze facial expressions (Direct > Averted gaze) | SP |
| Pinkham et al., 2018 | Emotion recognition task (Introspective accuracy > Control) | EP |
| Quintana et al., 2011 | Simultaneous facial information matching (Emotion matching > Identity matching)\* | EP |
| Rahm et al., 2015 | Hariri’s Faces Matching task (Affective faces > Geometrical shapes)\* | EP |
| Rapp et al., 2013 | Irony comprehension task (Irony > Control) | TM |
| Razafimandimby et al., 2016 | Emotion identification task (Emotional > Grammatical) | EP |
| Renes et al., 2016 | Agency inference task (Agency > No self-agency)\* | AB |
| Reske et al., 2007 | Emotional faces task (Sadness > Baseline) | EP |
| Schwarz et al., 2020 | Incentive delay task (Reward feedback)\* | EP |
| Segarra et al., 2016 | Slot-machine game (Win > Full-miss)\* | EP |
| Shad et al., 2012 | Self-awareness task (Self-referential (self-directed) > Other-referential (other-directed)) | AB |
| Shin et al., 2015 | Virtual social perception task (Inappropriate > Appropriate) | SP |
| Singh et al., 2015 | Empathy task (Negative > Baseline) | EP |
| Smith et al., 2015 | Emotional perspective task (Emotional scene correct trials) | TM |
| Spilka et al., 2015 | Passive viewing of facial emotions task (Sad > Neutral, Happy > Neutral)\* | EP |
| Subramaniam et al., 2015 | Monetary Incentive Delay task (Punishment loss > No monetary loss) | EP |
| Subramaniam et al., 2017 | Mood induction reality monitoring task (Positive/Negative > Neutral mood induction)\* | EP |
| Surguladze et al., 2006 | Fearful faces task (Neutral > Baseline fixation cross) | EP |
| Surguladze et al., 2011 | Emotional faces task (Happy > Neutral) | EP |
| Swart et al., 2013 | Associative emotional learning task (Negative > Neutral, Positive > Neutral)\* | EP |
| Takahashi et al., 2004 | Affective processing task (Unpleasant > Neutral) | EP |
| Taylor et al., 2011 | Emotional faces preference task (Negative preference > Gender) | SP |
| Tseng et al., 2016 | Emotion recognition task (High intensity prosodic voices > Low intensity prosodic voices) | EP |
| van der Meer et al., 2014 | Emotion regulation task (Reappraisal > Attend negative) | EP |
| Vanes et al., 2018 | Probabilistic reinforcement learning task (Win RPE) | EP |
| Varga et al., 2013 | Irony comprehension task (Irony > Control) | TM |
| Vercammen et al., 2012 | Emotional Go-NoGo task (Inhibit negative > Inhibit neutral) | EP |
| Vistoli et al., 2017 | Pain empathy task (Pain > No pain) | TM |
| Walter et al., 2009 | Comic strips task (Communicative intention > Physical causality) | TM |
| Whalley et al., 2009 | Emotion recognition task (Positive > Neutral)\* | EP |
| Williams et al., 2004 | Face processing task (Fear > Neutral) | EP |

Abbreviations: AB, attributional bias; EP, emotional perception and processing; HCP, human connectome project; RPE, reward prediction error; SP, social perception and knowledge; TM, theory of mind; WM, working memory. \*Data-set without significant results.

**Supplementary Table 6.** Number of data-sets available for each subgroup meta-analysis for the three different modalities.

|  |  |  |  |
| --- | --- | --- | --- |
| **Subgroup** | **VBM** | **Neurocognitive** | **Social cognitive** |
| 0% medicated | 14\* | 1 | 1 |
| 100% medicated | 67\* | 93\* | 61 |
| Illness Duration 0-2 years | 20\* | 14\* | 2 |
| Illness Duration 3-10 years | 26\* | 34 | 25 |
| Illness Duration >10 years | 41\* | 51\* | 32 |
| PANSS Total High | 36\* | 34\* | 24 |
| PANSS Total Low | 36\* | 33\* | 23 |
| PANSS Pos High | 36\* | 30 | 27\* |
| PANSS Pos Low | 35\* | 29\* | 24 |
| PANSS Neg High | 36\* | 29 | 25\* |
| PANSS Neg Low | 35\* | 29\* | 25 |
| PANSS Gen High | 32\* | 25 | 23 |
| PANSS Gen Low | 36\* | 26 | 22 |
| PS | - | 18 | - |
| AV | - | 15\* | - |
| WM | - | 57 | - |
| VeLM | - | 12 | - |
| ViLM | - | 16 | - |
| EF | - | 14 | - |
| VF | - | 5 | - |
| VC | - | 9 | - |
| TM | - | - | 15\* |
| EP | - | - | 53 |
| SP | - | - | 11 |
| AB | - | - | 7 |

Abbreviations: AB, attributional bias; AV, attention/vigilance; EF, executive function/reasoning and problem solving; EP, emotional perception and processing; PANSS, The Positive and Negative Syndrome Scale; PS, processing speed; SP, social perception and knowledge; TM, theory of mind; VBM, voxel-based morphometry; VC, verbal comprehension; VeLM, verbal learning and memory; VF, verbal fluency; ViLM, visual learning and memory; WM, working memory. \*Exploratory meta-analysis with significant TFCE-corrected results.

**Supplementary Table 7.** Results of the subgroup exploratory meta-analyses with VBM studies for the Controls > Patients contrast.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Subgroup** | **Cluster** | **Ke** | **MNI coordinates (x, y, z)** | **SDM-Z** | **Voxel P** |
| 0% medicated (n=14) | Left rolandic operculum / insula / STG / IFG | 4753 | -44, -8, 6 | -5.825 | <0.0001 |
| Left dmPFC / SMA / cingulate gyrus | 1490 | -2, 30, -10 | -5.94 | <0.0001 |
| Right dmPFC / SMA / cingulate gyrus | 924 | 2, -24, 34 | -5.884 | <0.0001 |
| Right STG | 126 | 56, -10, -2 | -4.43 | 0.036 |
| Right postcentral gyrus | 116 | 56, -20, 38 | -4.797 | 0.014 |
| Right MTG | 73 | 54, -56, 18 | -4.378 | 0.033 |
| Right precentral gyrus | 35 | 38, -14, 46 | -4.216 | 0.043 |
| 100% medicated (n=67) | Left rolandic operculum / insula / STG / IFG | 7492 | -44, 4, -10 | -10.088 | <0.0001 |
| Right STG / insula / IFG | 6427 | 52, 8,-10 | -9.235 | <0.0001 |
| Bilateral dmPFC / cingulate gyri | 5781 | 0, 44, 34 | -8.756 | <0.0001 |
| Illness Duration 0-2 years (n=20) | Left STG / insula / IFG | 1839 | -48, -10, 0 | -5.709 | <0.0001 |
| Illness Duration 3-10 years (n=26) | Left rolandic operculum / insula / STG / IFG | 6249 | -50, -4, 6 | -10.131 | <0.0001 |
| Right rolandic operculum / insula / STG / IFG | 4641 | 50, 2, 0 | -9.183 | <0.0001 |
| Left dmPFC / cingulate gyrus | 1125 | -8, 52, -4 | -5.861 | 0.004 |
| Right SMA | 591 | 4, 16, 48 | -5.057 | 0.01 |
| Right cingulate gyrus | 160 | 10, -24, 40 | -5.921 | 0.02 |
| Right MFG | 21 | 46, 48, 12 | -3.865 | 0.042 |
| Illness Duration >10 years (n=41) | Bilateral dmPFC / SMA / cingulate gyri | 4913 | 0, 48, 16 | -9.86 | <0.0001 |
| Left IFG / insula / STG | 2668 | -46, 14, 0 | -9.25 | <0.0001 |
| Right rolandic operculum / insula / STG / IFG | 1748 | 44, 14, -14 | -8.347 | <0.0001 |
| PANSS Total High (n=36) | Left rolandic operculum / insula / STG / IFG | 8905 | -48, -22, 12 | -9.352 | <0.0001 |
| Bilateral dmPFC / SMA / cingulate gyri | 8271 | -6, -28, 44 | -7.06 | <0.0001 |
| Right rolandic operculum / insula / STG / IFG | 2806 | 54, -10, -8 | -7.783 | <0.0001 |
| Right MFG | 478 | 46, 44, 8 | -6.274 | <0.0001 |
| Right precentral / postcentral gyri | 114 | 56, -18, 38 | -4.591 | 0.025 |
| Left supramarginal gyrus | 62 | -58, -46, 34 | -3.999 | 0.033 |
| Left supramarginal gyrus | 30 | -48, -42, 26 | -3.766 | 0.045 |
| Right SFG (dorsolateral) | 22 | 24, 44, 34 | -3.387 | 0.047 |
| PANSS Total Low (n=36) | Left IFG / insula / STG | 9640 | -44, 16, -12 | -7.24 | <0.0001 |
| Right insula / STG / supramarginal gyrus / IFG | 6113 | 48, 12, -6 | -8.571 | <0.0001 |
| Bilateral dmPFC / SMA / cingulate gyri | 5676 | 2, 48, 12 | -7.803 | <0.0001 |
| PANSS Pos High (n=36) | Left rolandic operculum / insula / STG / IFG | 7896 | -52, -10, 6 | -10.197 | <0.0001 |
| Bilateral dmPFC / SMA / cingulate gyri | 7854 | -8, 52, -4 | -7.589 | <0.0001 |
| Right rolandic operculum / insula / STG / IFG | 4782 | 52, 16, -6 | -7.641 | <0.0001 |
| Bilateral thalamus | 469 | -4, -12, 4 | -6.713 | 0.002 |
| Right angular gyrus | 457 | 52, -54, 32 | -5.127 | <0.0001 |
| PANSS Pos Low (n=35) | Right insula / STG / supramarginal gyrus / IFG | 6976 | 50, 6, -10 | -7.736 | <0.0001 |
| Left STG / insula / IFG / cerebellum | 6343 | -44, 4, -12 | -7.25 | <0.0001 |
| Bilateral dmPFC / SMA / cingulate gyri | 4261 | 2, 36, 20 | -7.437 | <0.0001 |
| Left MTG | 646 | -58, -32, 0 | -4.561 | 0.008 |
| PANSS Neg High (n=36) | Left rolandic operculum / insula / STG / IFG | 6597 | -52, 10, -12 | -8.984 | <0.0001 |
| Right STG / postcentral gyrus / rolandic operculum | 4625 | 54, -10, -8 | -8.933 | <0.0001 |
| Bilateral dmPFC / SMA / cingulate gyri | 5110 | 4, -20, 44 | -6.343 | <0.0001 |
| Right IFG | 295 | 50, 12, 30 | -6.87 | <0.0001 |
| PANSS Neg Low (n=35) | Bilateral dmPFC / SMA / cingulate gyri | 6633 | -2, 44, -6 | -8.958 | <0.0001 |
| Left insula / STG / hippocampus / amygdala | 8126 | -36, 22, -2 | -7.656 | <0.0001 |
| Right rolandic operculum / insula / STG / IFG | 5346 | 44, 14, -14 | -7.795 | <0.0001 |
| Right fusiform gyrus | 30 | 24, -38, -16 | -6.704 | 0.023 |
| Left MFG | 19 | -34, 56, -4 | -5.143 | 0.044 |
| PANSS Gen High (n=32) | Left rolandic operculum / insula / STG | 7506 | -48, -20, 12 | -9.596 | <0.0001 |
| Bilateral dmPFC / SMA / cingulate gyri | 5516 | -6, -26, 42 | -6.786 | <0.0001 |
| Right STG / postcentral gyrus | 1537 | 54, -10, -8 | -8.623 | <0.0001 |
| Right MFG | 10 | 46, 44, 10 | -5.567 | 0.035 |
| PANSS Gen Low (n=36) | Left insula / STG / cerebellum / amygdala | 8810 | -38, 20, -4 | -6.574 | <0.0001 |
| Bilateral dmPFC / SMA / cingulate gyri | 5642 | 2, 44, -6 | -7.732 | <0.0001 |
| Right rolandic operculum / insula / STG | 5344 | 50, 12, -8 | -7.873 | <0.0001 |

Abbreviations: Ke, cluster extent; MNI, Montreal Neurological Institute; SDM, Signed Differential Mapping; P, p-value; n, number of data-sets included; PANSS, The Positive and Negative Syndrome Scale.

**Supplementary Table 8.** Results of the subgroup exploratory task-based meta-analyses with neurocognitive fMRI studies for the Patients > Controls (positive sign in SDM-Z) and the Controls > Patients (negative sign in SDM-Z) contrasts.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Subgroup** | **Cluster** | **Ke** | **MNI coordinates (x, y, z)** | **SDM-Z** | **Voxel P** |
| 100% medicated (n=93) | Bilateral dmPFC / SMA | 153 | 0, 22, 50 | -4.66 | 0.004 |
| Right IFG | 13 | 42, 10, 32 | -4.418 | 0.04 |
| Right IFG | 11 | 50, 18, 26 | -4.274 | 0.04 |
| Illness Duration 0-2 years (n=14) | Right superior parietal gyrus | 220 | 22, -66, 50 | -5.762 | 0.002 |
| Illness Duration >10 years (n=51) | Bilateral vmPFC | 330 | 4, 48, 0 | 4.3 | 0.005 |
| Bilateral dmPFC / SMA | 408 | -2, 24, 50 | -5.664 | <0.0001 |
| PANSS Total High (n=34) | Left precentral gyrus | 32 | -46, -4, 48 | -5.123 | 0.022 |
| PANSS Total Low (n=33) | Bilateral median / posterior cingulate gyri | 163 | 0, -42, 34 | 4.187 | 0.006 |
| PANSS Pos Low (n=29) | Right rolandic operculum | 355 | 58, -16, 16 | 4.419 | 0.008 |
| PANSS Neg Low (n=29) | Right rolandic operculum | 127 | 56, -14, 10 | 4.592 | 0.019 |
| Bilateral median / posterior cingulate gyri | 106 | 0, -36, 36 | 3.972 | 0.031 |
| AV (n=15) | Bilateral dmPFC / cingulate gyri | 684 | -6, 12, 34 | -3.858 | 0.007 |
| Left MTG | 142 | -60, -34, 4 | -4.15 | 0.008 |
| Left precentral / postcentral gyri | 64 | -58, -2, 28 | -4.171 | 0.013 |
| Left STG | 20 | -60, -38, 18 | -3.488 | 0.047 |

Abbreviations: Ke, cluster extent; MNI, Montreal Neurological Institute; SDM, Signed Differential Mapping; P, p-value; n, number of data-sets included; PANSS, The Positive and Negative Syndrome Scale; AV, attention/vigilance.

**Supplementary Table 9.** Results of the subgroup exploratory task-based meta-analyses with social cognitive fMRI studies for the Controls > Patients contrast.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Subgroup** | **Cluster** | **Ke** | **MNI coordinates (x, y, z)** | **SDM-Z** | **Voxel P** |
| PANSS Pos High (n=27) | Right IFG | 49 | 50, 34, 10 | -4.129 | 0.018 |
| PANSS Neg High (n=25) | Right angular gyrus | 126 | 54, -52, 34 | -4.061 | <0.0001 |
| Right MOG | 40 | 38, -70, 36 | -4.093 | 0.024 |
| TM (n=15) | Right MTG | 24 | 48, -58, 16 | -3.451 | 0.037 |

Abbreviations: Ke, cluster extent; MNI, Montreal Neurological Institute; SDM, Signed Differential Mapping; P, p-value; n, number of data-sets included; PANSS, The Positive and Negative Syndrome Scale; TM, theory of mind.

**Supplementary Table 10.** Results of the subgroup exploratory multimodal meta-analyses.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Multimodal meta-analysis** | **Subgroup** | **Cluster** | **Ke** | **MNI coordinates (x, y, z)** | **SDM-Z\*** | **Voxel P** |
| VBM – Neurocognitive | 100% medicated | Left dmPFC / SMA | 66 | -4, 24, 48 | -4.26 | 0.005 |
| Right IFG | 11 | 50, 18, 26 | -4.274 | 0.04 |
| Illness Duration >10 years | Bilateral vmPFC | 326 | 4, 48, 0 | 4.3 | 0.005 |
| PANSS Pos Low | Right rolandic operculum | 351 | 64, -18, 16 | 4.169 | 0.008 |
| PANSS Neg Low | Right rolandic operculum | 63 | 62, -12, 8 | 4.008 | 0.025 |
| AV | Bilateral cingulate gyri | 684 | -6, 12, 34 | -3.858 | 0.007 |
| Left MTG | 128 | -60, -34, 4 | -4.15 | 0.008 |
| Left precentral / postcentral gyri | 42 | -58, 0, 30 | -3.768 | 0.018 |
| Left STG | 12 | -56, -38, 16 | -3.473 | 0.047 |
| VBM – Social cognitive | PANSS Pos High | Right IFG | 47 | 50, 34, 10 | -4.129 | 0.018 |
| TM | Right MTG | 18 | 50, -58, 16 | -3.426 | 0.037 |

Abbreviations: Ke, cluster extent; MNI, Montreal Neurological Institute; SDM, Signed Differential Mapping; P, p-value; VBM, voxel-based morphometry; PANSS, The Positive and Negative Syndrome Scale; AV, attention/vigilance; TM, theory of mind. \*A negative SDM-Z sign represents both GMV and activation decreases, while a positive SDM-Z sign represents GMV decreases coupled with activation increases.

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