|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Study** | **Study n****Behavioural results** | **N, Age, Sample, IQ** | **Task****Analysis** | **Contrast** | **Brain activation** | **Coordinates****MNI** |
| **SZ** |  |  |  |  |  |  |  |  |  |
| Meta-analysis |  |  |  |  |  |  |  |  |
|  | Sugranyes et  | 9 | SZ = 133 | Meta ALE | Variety of ToM tasks > Control | **SZ < HC:** |  |  |  |
|  | al. 2011 |  | HC = 140 | ROI |  | L Medial Frontal Gyrus | -5 | 57 | 19 |
|  |  |  | Mean age = 31.6 | Whole brain  |  | R Posterior Cingulate | 12 | -30 | 23 |
|  |  |  | Inpatients |  |  | L Middle Temporal Gyrus | -61 | -37 | 5 |
|  |  |  | Outpatients |  |  | L Pulvinar | -5 | -32 | 8 |
|  |  |  | IQ: NR |  |  | **SZ>HC:** |  |  |  |
|  |  |  |  |  |  | R Posterior Cingulate | 1 | -13 | 24 |
|  |  |  |  |  |  | R Paracentral Lobule | 4 | -33 | 59 |
| Studies comparing mental state attribution > control  |  |  |  |  |  |  |  |
|  | Derntl et al. |  | SZ = 15 (5F) | Mental state attribution | Mental state > Control | **SZ < HC:** |  |  |  |
|  | 2012 |  | HC = 15 (5F) | To social characters with |  | R Lateral Globus Pallidus (Thalamus) | 14 | 6 | -4 |
|  |  |  | Mean age  | Masked faces by |  | R No Gray Matter (Orbitofrontal Gyrus) | 32 | 40 | -4 |
|  |  |  | SZ: 34.2 (9.1) | Selecting right emotional  |  | R Middle Frontal Gyrus | 44 | 2 | 42 |
|  |  |  | HC: 30.4 (8.9) | Face expression to situation |  | R Precuneus | 20 | -58 | 42 |
|  |  |  | Inpatients | Control: indicating whether  |  | L Superior Frontal Gyrus | -16 | 52 | 42 |
|  |  |  | Outpatients | Left or right face was  |  | R Inferior Frontal Gyrus (Superior Frontal Gyrus) | 52 | 30 | 8 |
|  |  |  | IQ: No difference | masked |  | L Inferior Frontal Gyrus | -42 | 34 | 2 |
|  |  |  |  | Whole brain |  | L Middle Temporal Gyrus (Inferior Frontal Gyrus) | -40 | -78 | 14 |
|  |  |  |  |  |  | R Cuneus (Middle Occipital Gyrus) | 26 | -82 | 14 |
|  |  |  |  |  |  | L No Gray Matter (Middle Temporal Gyrus) | -46 | -50 | 0 |
|  |  |  |  |  |  | **SZ > HC: none** |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  | Lee et a. 2011 | SZ < HC | SZ = 14 (3F) | False belief ToM | False belief > False  | **SZ < HC:** |  |  |  |
|  |  | False belief attribution | HC = 14 (3F) | vignettes | Photograph | L Angular gyrus | -48 | -72 | 38 |
|  |  | False photo recognition | Mean age  | Whole brain |  | L Cingulate gyrus | -8 | -22 | 32 |
|  |  | Simple reading | SZ: 38.3 (10.7) |  |  | R Cingulate gyrus | 4 | 8 | 32 |
|  |  |  | HC: 42.5 (7.7) |  |  | R Culmen | 26 | -46 | -16 |
|  |  |  | IQ: NR |  |  | R Fusiform gyrus | 32 | -46 | -16 |
|  |  |  |  |  |  | R Putamen (Globus Pallidus) | 28 |  -12 | -2 |
|  |  |  |  |  |  | L Inferior Parietal Lobule | -52 | -58 | 46 |
|  |  |  |  |  |  | L Medial Prefrontal Cortex | -2 | 0 | 50 |
|  |  |  |  |  |  | L Middle temporal gyrus | -48 | -66 | 16 |
|  |  |  |  |  |  | Paracentral lobule | 0 | -12 | 48 |
|  |  |  |  |  |  | R Parahippocampus | 32 | -10 | -20 |
|  |  |  |  |  |  | L Postcentral gyrus | -38 | -16 | 32 |
|  |  |  |  |  |  | R Postcentral gyrus | 50 | -2 | 30 |
|  |  |  |  |  |  | R Posterior cingulate cortex | 8 | -58 | 8 |
|  |  |  |  |  |  | L Postcentral Gyrus (Precentral gyrus) | -50 | -12 | 36 |
|  |  |  |  |  |  | Precuneus | 0 | -70 | 46 |
|  |  |  |  |  |  | L Precuneus | -28 | -78 | 48 |
|  |  |  |  |  |  | L Middle Temporal Gyrus (Superior lateral occipital gyrus) | -52 | -74 | 26 |
|  |  |  |  |  |  | R Thalamus | 4 | -12 | 12 |
|  |  |  |  |  |  | L Thalamus | -8 | -12 | 12 |
|  |  |  |  | **SZ > HC:** none |  |  |  |
| Studies comparing irony comprehension > control |  |  |  |  |  |  |  |
|  | Varga et al.  | SZ < HC  | SZ = 21 (12F) | Irony comprehension | Irony context > | **SZ < HC:** none |  |  |  |
|  | 2013 | Irony comprehension | HC = 24 (15F) | From auditory stories | Control (physical causality) | **SZ > HC:** |  |  |  |
|  |  |  | Mean age  | Whole Brain |  | L Inferior Frontal Gyrus/Pars Operculatis | -44 | 8 | 28 |
|  |  |  | SZ: 40 (9.1) |  |  | L Inferior Parietal Lobule | -40 | -50 | 40 |
|  |  |  | HC: 34 (8.5) |  | Irony statement > | **SZ < HC:**  |  |  |  |
|  |  |  | Patients in remission |  | Control (physical causality) | R Superior Frontal Gyrus (Medial Frontal Gyrus) | 42 | 42 | 20 |
|  |  |  | IQ: SZ < HC |  |  | R Inferior Frontal Gyrus (Temporal Pole ) | 54 | 20 | -10 |
|  |  |  |  |  |  | R Inferior Parietal Lobule | 52 | -30 | 52 |
|  |  |  |  |  |  | **SZ > HC:** none |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  | Rapp et al.  | SZ < HC  | SZ = 15 (female only) | Irony comprehension | Ironic sentence > | **SZ < HC:** |  |  |  |
|  | 2013 | Irony comprehension | HC = 15 | vignettes | Control sentence | R Superior Temporal Gyrus (Middle Temporal) | 51 | -54 | 15 |
|  |  | Pos symptoms neg  | Mean age  | Whole Brain  |  | R Postcentral gyrus (Rolandic Operculum) | 57 | -12 | 18 |
|  |  | related to insula and  | SZ: 28.1 |  |  | R Precentral Gyrus (Postcentral Gyrus) | 48 | -12 | 33 |
|  |  | STG | HC: 32.9 |  |  | **SZ > HC:** none |  |  |  |
|  |  |  | IQ: No difference |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| Studies comparing mental state attribution to shapes > control |  |  |  |  |  |  |  |
|  | Das et al.  | SZ < HC | SZ = 20 (male only) | Mental state attribution to  | Mental attribution to  | **SZ < HC:** |  |  |  |
|  | 2012 | intentionality rating | HC = 19 | moving shapes | Moving shapes > | R Precentral gyrus (Inferior Frontal Gyrus) | 54 | 16 | 2 |
|  |  | appropriateness | Mean age  | ROI | Random motion | R Inferior Frontal Gyrus | 46 | 16 | 20 |
|  |  | Symptoms & ToM | SZ: 34.5 (8.4) |  |  | L Inferior Frontal Gyrus | -52 | 24 | 4 |
|  |  | unrelated to BOLD | HC: 33.5 (8.4) |  |  | R Superior Temporal Gyrus | 68 | -34 | 10 |
|  |  |  | IQ: NR |  |  | **SZ>HC:** none |  |  |  |
|  |  | changes |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  | Pedersen et  | SZ < HC Tom  | SZ = 15 (6F) | Mental state attribution to  | Mental attribution to  | **SZ < HC:** |  |  |  |
|  | al. 2012 | classification | HC = 14 (5F) | moving shapes | moving shapes > | Inferior Occipital Gyrus | 36 | -86 | -1 |
|  |  | SZ = HC Random & | Mean age  | Whole brain | Random & goal directed | **SZ > HC:** |  |  |  |
|  |  | Goal directed movement | SZ: 29 (8.2) |  | movement | R Paracentral lobule (Precuneus) | 21 | -35 | 49 |
|  |  | SZ < HC intentionality  | 29.9 (8.8) |  |  | R Inferior Frontal Gyrus | 33 | 29 | -17 |
|  |  | rating(post scan) | Inpatients |  |  | R Inferior Frontal Gyrus | 51 | 41 | -7 |
|  |  |  | IQ: No difference |  |  | R Middle Frontal Gyrus | 29 | 50 | -12 |
|  |  |  |  |  |  | L Superior Temporal Gyrus | -51 | -12 | 6 |
|  |  |  |  |  |  | L Cerebellum | -4 | -44 | -34 |
|  |  |  |  |  |  |  |  |  |  |
| **ASD** |  |  |  |  |  |  |  |  |  |
| Meta-analysis |  |  |  |  |  |  |  |  |
|  | Sugranyes et  | 7 | ASD = 88 | Meta ALE | Variety of ToM tasks > Control | **ASD < HC:** |  |  |  |
|  | al. 2011 |  | HC = 98 | ROI |  | L Medial Frontal Gyrus | -1 | 60 | 21 |
|  |  |  | Mean age = 18.3 | Whole brain  |  | R Precentral Gyrus | 61 | 11 | 2 |
|  |  |  | Children, adolescents &  |  |  | L Anterior Cingulate | -1 | 3 | 40 |
|  |  |  | adults |  |  | L Amygdala | -23 | -8 | -12 |
|  |  |  | High functioning  |  |  | L Middle Temporal Lobe | -59 | -37 | 0 |
|  |  |  | IQ: NR |  |  | L Inferior Parietal | -39 | -28 | 53 |
|  |  |  |  |  |  | **ASD > HC:** none |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| Studies comparing mental state attribution > control |  |  |  |  |  |  |  |
|  | Lombardo et al.  | ASD = HC | ASD = 29 (male only) | Mental state attribution or |  | **ASD < HC:** | NR | NR | NR |
|  | 2011 | ToM & | HC = 33 | Physical judgement | ToM > Physical Causality | R Temporal-Parietal Junction |  |  |  |
|  |  | Physical judgments | Mean age  | about self or other |  | Mid/posterior Superior Temporal gyrus/sulcus |  |  |  |
|  |  | Individuals with greatest | ASD: 26.6 (7) | Whole Brain |  | Posterior Middle Temporal Gyrus |  |  |  |
|  |  | Social symptom severity | HC: 28 (6.1) |  |  | Inferior/Superior Parietal Lobule |  |  |  |
|  |  | showed least selective  | Adults |  |  | Precuneus |  |  |  |
|  |  | rTPJ In response to ToM | IQ: No difference |  |  | Pre/postcentral gyrus |  |  |  |
|  |  |  |  |  |  | Posterior/middle frontal gyrus |  |  |  |
|  |  |  |  |  |  | Posterior/mid insula |  |  |  |
|  |  |  |  |  |  | **ASD > HC:** none |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  | Kana et al. |  | ASD = 18 | Mental state or | ToM > Physical Causality | **ASD < HC** |  |  |  |
|  | 2014 |  | HC = 15 | Physical causal attribution |  | R IPL/angular Gyrus | 32 | -52 | 42 |
|  |  |  | Mean age  | Cartoon Stories |  | R Inferior Frontal Triangularis | 54 | 38 | 2 |
|  |  |  | ASD = 21.1 (1) | ROI |  | R Precuneus (Cuneus) | 22 | -76 | 46 |
|  |  |  | HC: 22.3 (1.1) |  |  | L Precuneus (Inferior Parietal Cortex) | -30 | -70 | 46 |
|  |  |  | Adolescents & Adults |  |  | **ASD > HC:** none |  |  |  |
|  |  |  | IQ: No difference |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| Studies comparing irony comprehension > baseline |  |  |  |  |  |  |  |
|  | Wang et al. | 1 | ASD = 18 (male only) | Irony comprehension | Prosodic cue & | **ASD < HC:** none |  |  |  |
|  | 2006 | ASD < HC | HC = 18 |  | Story (irony/no irony) > | **ASD > HC:** |  |  |  |
|  |  | Irony comprehension | Mean age  |  | Baseline | L Postcentral Gyrus (Precentral Gyrus) | -41 | -19 | 58 |
|  |  | Social & communicative | ASD: 11.9 (2.8) |  |  | L Inferior Frontal Gyrus | -57 | 24 | 7 |
|  |  | impairment neg. related  | HC: 11.9 (2.3) |  |  | R Inferior Frontal Gyrus | 53 | 27 | -6 |
|  |  | to temporal pole activity | Children & Adolescents |  |  | R Middle (Inferior) Frontal Gyrus | 48 | 42 | -12 |
|  |  |  | IQ: No difference |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| **SZ vs ASD** |  |  |  |  |  |  |  |  |
| Meta-analysis |  |  |  |  |  |  |  |  |  |
|  | Sugranyes et al. | ASD = 7 | ASD = 88 | Meta ALE | Variety of ToM tasks > Control | **ASD > SZ:** |  |  |  |
|  | 2011 | SZ = 9 | SZ = 133 | ROI |  | R Insula | 36 | 1 | 8 |
|  |  |  | Mean age = 24.9 | Whole brain |  | **SZ > ASD:** |  |  |  |
|  |  |  | IQ: NR |  |  | R Medial Frontal  | 9 | 66 | -7 |
|  |  |  |  |  |  | L Paracentral Lobule | 2 | -31 | 57 |
|  |  |  |  |  |  | L Posterior Cingulate | 1 | -13 | 24 |
|  |  |  |  |  |  | L Posterior Cingulate | -5 | -27 | 36 |
|  |  |  |  |  |  |  |  |  |  |
| **PP vs ASD** |  |  |  |  |  |  |  |  |
| Studies comparing mental state attribution > control |  |  |  |  |  |  |  |
|  | O’Nions et al.  |  | ASD = 16 (male only) | ToM Cartoon Stories | ToM > Physical Causality | **ASD < PP & HC:** |  |  |  |
|  | 2014 | PP = ASD ToM or RT | PP = 16 | ROI  |  | L Superior Frontal Gyrus (Medial Prefrontal Cortex) | -8 | 60 | 8 |
|  |  | ASD: Social &  | HC = 16 |  |  | L Superior Frontal Gyrus (Medial Prefrontal Cortex) | -12 | 54 | 16 |
|  |  | communicative impairment | Mean age |  |  | L Medial Prefrontal Cortex (Ventromedial l) | -4 | 60 | -4 |
|  |  | Neg. related to mPFC  | ASD: 14.2 (1.6) |  |  | **ASD > PP & HC:** none |  |  |  |
|  |  | activation Social impairment  | PP: 14.2 (1.9) |  |  | **PP < HC:** none |  |  |  |
|  |  | Neg. related to rTPJ | HC: 13.5 (1.7) |  |  | **PP > HC:** none |  |  |  |
|  |  |  | Children & Adolescents |  |  |  |  |  |  |
|  |  |  | IQ: PP < HC & ASD |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| **PP** |  |  |  |  |  |  |  |  |  |
| Studies comparing mental state attribution > control/baseline |  |  |  |  |  |  |  |
|  | Sommer et al. | PP = HC  | PP = 14 | Emotion attribution | ToM > Non-ToM fact/reality | **PP < HC:** none |  |  |  |
|  | 2010 |  | PCL-r ≥ 28, mean 28.6 | in ToM Cartoon |  | **PP > HC:** |  |  |  |
|  |  |  | HC =14 | Answering questions  |  | L Orbitofrontal Cortex | 6 | 46 | -21 |
|  |  |  | PCL-r ≤ 15, mean: 9.6 | about Non-ToM stories |  |  |  |  |  |
|  |  |  | Mean age  |  |  |  |  |  |  |
|  |  |  | PP: 31.4 (7.9) |  |  |  |  |  |  |
|  |  |  | HC: 29.2 (5.8) |  |  |  |  |  |  |
|  |  |  | Forensic sample | Whole Brain  |  |  |  |  |  |
|  |  |  | IQ: no difference |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  | Mier et al. | PP = HC | PP = 11 (male only) | Mental state attribution to | ToM > baseline | **PP < HC:** |  |  |  |
|  | 2014 |  | PCL-r ≥ 25, mean: 26.7 | emotion picture |  | R Culmen (Fusiform Gyrus) | 24 | -54 | -12 |
|  |  |  | HC = 18 | Whole brain |  | L Amygdala | -18 | -3 | -18 |
|  |  |  | Mean age  |  |  | **PP > HC:** none |  |  |  |
|  |  |  | PP: 44.6 (9) |  |  |  |  |  |  |
|  |  |  | HC: 44 (10.4) |  |  |  |  |  |  |
|  |  |  | Incarcerated |  |  |  |  |  |  |
|  |  |  | IQ: no difference |  |  |  |  |  |  |