TECHNICAL COMMENTARY

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Social cognition

Introduction

Social cognition describes the ability to understand the actions and intentions of other people; the cognitive processes underlying social interactions that are used to guide behaviour. Aspects of social cognition may be altered in people with bipolar disorder, including processes such as Theory of Mind, social perception, and emotion processing. Theory of Mind refers to the ability to infer the mental states of other people. Social perception is an awareness of social cues and norms that dictate social interactions. Emotion processing is the ability to perceive emotional cues, such as the emotional content of facial expressions or vocal inflections (prosody). Social cognition is crucial for effective communication and relates to social competence and may predict work functioning.

Method

We have included only systematic reviews (systematic literature search, detailed methodology with inclusion/exclusion criteria) published in full text, in English, from the year 2010 that report results separately for people with a diagnosis of bipolar and related disorders. Reviews were identified by searching the databases MEDLINE, EMBASE, and PsycINFO. Hand searching reference lists of identified reviews was also conducted. When multiple copies of review topics were found, only the most recent and comprehensive review was included. Reviews with pooled data are prioritised for inclusion.

Review reporting assessment was guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist that describes a preferred way to present a meta-analysis[1]. Reviews with less than 50% of items checked have been excluded from the library. The PRISMA flow diagram is a suggested way of providing information about studies included and excluded with reasons for exclusion. Where no flow diagram has been presented by individual reviews, but identified studies have been described in the text, reviews have been checked for this item. Note that early reviews may have been guided by less stringent reporting checklists than the PRISMA, and that some reviews may have been limited by journal guidelines.

Evidence was graded using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) Working Group approach where high quality evidence such as that gained from randomised controlled trials (RCTs) may be downgraded to moderate or low if review and study quality is limited, if there is inconsistency in results, indirect comparisons, imprecise or sparse data and high probability of reporting bias. It may also be downgraded if risks associated with the intervention or other matter under review are high. Conversely, low quality evidence such as that gained from observational studies may be upgraded if effect sizes are large or if there is a dose dependent response. We have also taken into account sample size and whether results are consistent, precise and direct with low associated risks (see end of table for an explanation of these terms)[2]. The resulting table represents an objective summary of the available evidence, although the conclusions are solely the opinion of staff of NeuRA (Neuroscience Research Australia).

Results

We found six systematic reviews that met our inclusion criteria[3-8].

- High quality evidence suggests a small effect of poorer overall social cognition in people with bipolar disorder compared to controls.
- High quality evidence suggests poorer emotional intelligence, recognition of surprise, fear and disgust in people with bipolar disorder compared to controls, with no differences in recognition of anger, happiness or sadness.

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- Moderate to high quality evidence suggests a medium-sized effect of poorer theory of mind in people with bipolar disorder. The effect size was similar across tasks, but was larger in acute patients than in patients with subclinicial symptoms, or remitted patients.
- Moderate to high quality evidence suggests a medium-sized effect of poorer social cognition in people with schizophrenia than in people with bipolar disorder on Theory of Mind and negative facial emotion recognition tasks, particularly for male patients. There were no differences on positive (happy) facial emotion recognition tasks.
- High quality evidence suggests small effects of poorer social cognition in first-degree relatives of people with bipolar disorder compared to people with no first-degree relative with the disorder.
- Moderate to low quality evidence suggests a relationship between poor emotion processing (identification and regulation) and poor general functioning, particularly in people with more severe depressive symptoms.

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Bo Q, Mao Z, Li X, Wang Z, Wang C, Ma X

Use of the MATRICS consensus cognitive battery (MCCB) to evaluate cognitive deficits in bipolar disorder: A systematic review and meta-analysis

PLoS ONE 2017; 12 (4); doi.org/10.1371/journal.pone.0176212

View review abstract online

Comparison	**Social cognition in people with bipolar disorder vs. controls.**
Summary of evidence	**High quality evidence (large sample, consistent, precise, direct) suggests a small effect of poorer social cognition in people with bipolar disorder.**
Social cognition	
A significant, small effect of poorer attention in people with bipolar disorder; 7 studies, N = 487, d = -0.29, 95%CI -0.47 to -0.11, $p < 0.05$, I^2 = 48.6%, p = 0.07	
Consistency in results‡	Consistent
Precision in results§	Precise
Directness of results‖	Direct

Bora E, Bartholomeusz C, Pantelis C

Meta-analysis of Theory of Mind (ToM) impairment in bipolar disorder

Psychological Medicine 2016; 46: 253-64

View review abstract online

Comparison	**Theory of mind in people with bipolar disorder vs. controls.**
Summary of evidence	**Moderate to high quality evidence (large samples, inconsistent, precise, direct) suggests a medium-sized effect of poorer theory of mind in people with bipolar disorder. The effect size was similar across tasks, but was larger in acute patients than in patients with subclinicial symptoms, or remitted patients.**
Theory of mind	

A significant, medium-sized effect of poorer theory of mind in people with bipolar disorder; 34 studies, N = 2,311, *d* = 0.63, 95%CI 0.52 to 0.74, *p* < 0.001, Q*p* = 0.02 Subgroup analyses showed the effect size was larger in acute patients (*d* = 1.23) than in subsyndromal (*d* = 0.72) or remitted patients (*d* = 0.50), but was similar across tasks (reading the mind in the eyes task, false belief task, faux pas task and hinting task).

Consistency in results	Inconsistent
Precision in results	Precise
Directness of results	Direct

Bora E, Pantelis C

Social cognition in schizophrenia in comparison to bipolar disorder: A meta-analysis

Schizophrenia Research 2016; 175: 72-8

View review abstract online

Comparison	**Social cognition in people with bipolar disorder vs. people with schizophrenia.**
Summary of evidence	**Moderate to high quality evidence (large samples, inconsistent, precise, direct) suggests a medium-sized effect of poorer social cognition in people with schizophrenia than in people with bipolar disorder on Theory of Mind and negative facial emotion recognition tasks, particularly for male patients. There were no differences on positive (happy) facial emotion recognition tasks.**

Social cognition

A significant, medium-sized effect of poorer social cognition in people with schizophrenia;

Overall social cognition: 26 studies, N = 2,376, *d* = 0.45, 95%CI 0.31 to 0.60, *p* < 0.001, Q*p* < 0.001

The effect size was slightly smaller when the analysis included only samples of patients with bipolar disorder I (*d* = 0.39).

The effect size was larger for Theory of Mind tests than for facial emotion recognition tests (*d* = 0.57 vs. *d* = 0.39). The effect was significant only for negative, angry, and sad facial emotion recognition tests, and not happy facial emotion recognition tests.

Effect sizes were larger in studies that had a higher percentage of males in their schizophrenia sample.

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There were no effects of diagnostic tool (DSM-IV/IV-TR vs. DSM-IIIR), study setting (acute vs. non-acute), age, negative or positive symptoms, and age of onset and duration of bipolar disorder.	
Consistency in results	Inconsistent
Precision in results	Precise
Directness of results	Direct

Bora E, Ozerdem A

Social cognition in first-degree relatives of patients with bipolar disorder: A meta-analysis

European Neuropsychopharmacology 2017; 27: 293-300

View review abstract online

Comparison	**Social cognition in first-degree relatives of people with bipolar disorder vs. controls with no first-degree relative with bipolar disorder.**
Summary of evidence	**High quality evidence (large samples, precise, consistent, direct) suggests small effects of poorer social cognition in relatives of people with bipolar disorder.**
Social cognition	
Significant, small effects of poorer social cognition in relatives of people with bipolar disorder; Overall social cognition: 16 studies, N = 1,593, d = 0.25, 95%CI 0.14 to 0.36, $p < 0.001$, I^2 = 9%, p = 0.35 Theory of Mind: 9 studies, N = 485, d = 0.34, 95%CI 0.16 to 0.52, $p < 0.001$, I^2 = 6%, p = 0.39 Facial emotion recognition: 8 studies, N = 1,147, d = 0.17, 95%CI 0.16 to 0.29, p = 0.004, I^2 = 0%, p = 0.56 Authors report that the facial emotion recognition analysis may be non-significant after possible publication bias was taken into account. Subgroup analysis showed only facial expressions of anger and fear were significant, but not happy and sad. Meta-regression showed no effects of age or gender.	
Consistency	Consistent
Precision	Precise

Directness	Direct

Samame C, Martino DJ, Strejilevich SA

An individual task meta-analysis of social cognition in euthymic bipolar disorders

Journal of Affective Disorders 2015; 173: 146-53

View review abstract online

Comparison	**Emotion processing in people with bipolar disorder vs. controls.**
Summary of evidence	**High quality evidence (large samples, consistent, precise direct) suggests poorer emotional intelligence, recognition of surprise, fear and disgust in people with bipolar disorder, with no differences in recognition of anger, happiness of sadness.**

Emotion processing

Significant, small effects of poorer emotion processing on;

Emotional intelligence: 3 studies, N = 457, g = 0.32, 95%CI 0.13 to 0.51, p = 0.0009, I^2 = 0%, p = 0.66

Recognition of surprise: 5 studies, N = 368, g = 0.22, 95%CI 0.01 to 0.43, p = 0.04, I^2 = 0%, p = 0.96

Recognition of fear: 6 studies, N = 483, g = 0.39, 95%CI 0.13 to 0.66, p = 0.004, I^2 not reported

Recognition of disgust: 5 studies, N = 433, g = 0.43, 95%CI 0.19 to 0.67 p = 0.0004, I^2 not reported

Results for recognition of fear and disgust are reported with one outlier removed; authors report that these results are consistent. Recognition of disgust was subject to possible publication bias.

No significant differences on;

Recognition of anger: 7 studies, N = 483, g = 0.15, 95%CI -0.04 to 0.33, p = 0.12, I^2 = 0%, p = 0.96

Recognition of happiness: 7 studies, N = 483, g = 0.16, 95%CI -0.07 to 0.39, p = 0.16, I^2 = 32%, p = 0.18

Recognition of sadness: 7 studies, N = 483, g = 0.18, 95%CI -0.02 to 0.38, p = 0.08, I^2 = 14%, p = 0.33

Consistency in results	Consistent
Precision in results	Precise
Directness of results	Direct

Vlad M, Raucher-Chene D, Henry A, Kaladjian A

Functional outcome and social cognition in bipolar disorder: Is there a connection?

European Psychiatry 2018; 52: 116-25

View review abstract online

Comparison	**Associations between social cognition and functioning in people with bipolar disorder.**
Summary of evidence	**Moderate to low quality evidence (unclear sample size, appears consistent, unable to assess precision, direct) suggests a relationship between poor emotion processing (identification and regulation) and poor general functioning, particularly in people with more severe depressive symptoms.**
General functioning	
12 of 13 studies reported a correlation between poor functioning and poor emotion processing (identification of specific emotions, and emotion regulation). 3 of 11 studies reported a correlation between poor functioning and poor Theory of Mind ability. 6 studies found a significant effect of worse depressive symptoms and worse emotion processing, with no associations between manic symptoms and emotion processing.	
Consistency in results	Appears consistent for emotion processing and depression symptoms.
Precision in results	Unable to assess; no confidence intervals are reported.
Directness of results	Direct

Explanation of acronyms

CI = confidence interval, *g* = Hedges's *g* standardised mean difference, I^2 = the percentage of the variability in effect estimates that is due to heterogeneity rather than sampling error (chance), N = number of participants, *p* = probability of rejecting a null hypothesis of no differences between groups, Q = test for heterogeneity

Explanation of technical terms

* Bias has the potential to affect reviews of both RCT and observational studies. Forms of bias include; reporting bias – selective reporting of results; publication bias - trials that are not formally published tend to show less effect than published trials, further if there are statistically significant differences between groups in a trial, these trial results tend to get published before those of trials without significant differences; language bias – only including English language reports; funding bias - source of funding for the primary research with selective reporting of results within primary studies; outcome variable selection bias; database bias - including reports from some databases and not others; citation bias - preferential citation of authors. Trials can also be subject to bias when evaluators are not blind to treatment condition and selection bias of participants if trial samples are small[9].

† Different effect measures are reported by different reviews.

Prevalence refers to how many existing cases there are at a particular point in time. Incidence refers to how many new cases there are per population in a specified time period. Incidence is usually reported as the number of new cases per 100,000 people per year. Alternatively some studies present the number of new cases that have accumulated over several years against a person-years denominator. This denominator is the sum of individual units of time that the persons in the population are at risk of becoming a case. It takes into account the size of the underlying population sample and its age structure over the duration of observation.

Reliability and validity refers to how accurate the instrument is. Sensitivity is the proportion of actual positives that are correctly identified (100% sensitivity = correct identification of all actual positives) and specificity is the proportion of negatives that are correctly identified (100% specificity = not identifying anyone as positive if they are truly not).

Weighted mean difference scores refer to mean differences between treatment and comparison groups after treatment (or occasionally pre to post treatment) and in a randomised trial there is an assumption that both groups are comparable on this measure prior to treatment. Standardised mean differences are divided by the pooled standard deviation (or the standard deviation of one group when groups are homogenous) that allows results from different scales to be combined and compared. Each study's mean difference is then given a weighting depending on the size of the sample and the variability in the data. Less than 0.4 represents a small effect, around 0.5 a medium effect, and over 0.8 represents a large effect[9].

Odds ratio (OR) or relative risk (RR) refers to the probability of a reduction (< 1) or an increase (> 1) in a particular outcome in a treatment group, or a group exposed to a risk factor, relative to the comparison group. For example, a RR of 0.75 translates to a reduction in risk of an outcome of 25% relative to those not receiving the treatment or not exposed to the risk factor. Conversely, a RR of 1.25 translates to an increased risk of 25% relative to those not receiving treatment or not having been exposed to a risk factor. A RR or OR of 1.00 means there is no difference between groups. A medium effect is considered if RR > 2 or < 0.5 and a large effect if RR > 5 or < 0.2[10]. lnOR stands for logarithmic OR where a lnOR of 0 shows no difference between groups. Hazard ratios measure the effect of an explanatory variable on the hazard or risk of an event.

Correlation coefficients (eg, r) indicate the strength of association or relationship

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between variables. They can provide an indirect indication of prediction, but do not confirm causality due to possible and often unforseen confounding variables. An r of 0.10 represents a weak association, 0.25 a medium association and 0.40 and over represents a strong association. Unstandardised (*b*) regression coefficients indicate the average change in the dependent variable associated with a 1 unit change in the independent variable, statistically controlling for the other independent variables. Standardised regression coefficients represent the change being in units of standard deviations to allow comparison across different scales.

‡ Inconsistency refers to differing estimates of effect across studies (i.e. heterogeneity or variability in results) that is not explained by subgroup analyses and therefore reduces confidence in the effect estimate. I^2 is the percentage of the variability in effect estimates that is due to heterogeneity rather than sampling error (chance) - 0% to 40%: heterogeneity might not be important, 30% to 60%: may represent moderate heterogeneity, 50% to 90%: may represent considerable heterogeneity and over this is considerable heterogeneity. I^2 can be calculated from Q (chi-square) for the test of heterogeneity with the following formula[9];

$$I^2 = \left(\frac{Q - df}{Q}\right) \times 100\%$$

§ Imprecision refers to wide confidence intervals indicating a lack of confidence in the effect estimate. Based on GRADE recommendations, a result for continuous data (standardised mean differences, not weighted mean differences) is considered imprecise if the upper or lower confidence limit crosses an effect size of 0.5 in either direction, and for binary and correlation data, an effect size of 0.25. GRADE also recommends downgrading the evidence when sample size is smaller than 300 (for binary data) and 400 (for continuous data), although for some topics, these criteria should be relaxed[11].

‖ Indirectness of comparison occurs when a comparison of intervention A versus B is not available but A was compared with C and B was compared with C that allows indirect comparisons of the magnitude of effect of A versus B. Indirectness of population, comparator and/or outcome can also occur when the available evidence regarding a particular population, intervention, comparator, or outcome is not available and is therefore inferred from available evidence. These inferred treatment effect sizes are of lower quality than those gained from head-to-head comparisons of A and B.

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