TECHNICAL COMMENTARY

Signs and Symptoms – Social Cognition

Introduction
Social cognition describes the ability to understand the actions and intentions of other people, in other words, the cognitive processes underlying social interactions [1, 2] that are used to guide behaviour [3]. Aspects of social cognition may be altered in people with schizophrenia, including processes such as Theory of Mind, social perception, attribution style, and emotional processing [1, 2]. 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. Attribution style describes how an individual explains positive and negative events in their lives, for example, a tendency to blame other people rather than blaming the situation may reflect a “personalising bias” [1]. Lastly, emotional 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 non-verbal communication and may relate to social competence and predict work functioning [3].

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 2000 that report results separately for people with a diagnosis of schizophrenia, schizoaffective disorder, schizophreniform disorder or first episode schizophrenia. As part of a wider search for all topics included in the library, reviews on social cognition in schizophrenia were identified by searching the databases MEDLINE, EMBASE, CINAHL, Current Contents, PsycINFO and the Cochrane library. Hand searching reference lists of identified reviews was also conducted. When multiple copies of reviews were found, only the most recent version was included. The decision to include or exclude reviews was conducted in duplicate by two independent reviewers with any disagreements settled by discussion. All quality assessments and data extraction have been completed in duplicate by two reviewers who were not masked to review authors.

Review reporting assessment was guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist (formerly the QUOROM statement) which describes a preferred way to present a meta-analysis[4]. Reviews were assigned a low, medium or high possibility of reporting bias* depending on how many items were checked. For instance, a low possibility of bias would be assigned to reviews checking over 66% of items, a medium possibility between 33 and 66% and a high possibility would be given to reviews checking less than 33%. Reviews rated as having a high possibility of reporting bias 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 (RCT) may be downgraded to moderate, low or very 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)[5]. The resulting table represents an objective summary of the available evidence, although the conclusions are solely the opinion of staff of the Schizophrenia Research Institute.

Results

See table below for a detailed summary of the available evidence pertaining to social cognition in schizophrenia. We found 10 systematic reviews that met our inclusion criteria [3, 6-14]. Four non-systematic reviews were excluded [1, 2, 15, 16].

See PRISMA checklists for assessment of reporting transparency.

Conclusions

• Compared to controls, moderate quality evidence suggests a medium to large effect of poorer facial emotion perception, including identification and discrimination, and poorer non-emotional facial recognition in people with schizophrenia. Facial emotion perception may be affected by increased severity of negative symptoms and non-emotional recognition may be affected by increased severity of positive symptoms. Moderate quality evidence also shows a medium effect of poorer overall social cognition in people with first-episode schizophrenia.

• High quality evidence shows that people with schizophrenia experience greater aversion to positive and neutral stimuli, but not negative stimuli, and greater hedonic response to negative, but not positive or neutral stimuli compared to controls.

• High quality evidence shows that better community functioning may be associated with better Theory of Mind, emotion processing, information processing, verbal learning, working memory, attention and reasoning ability. Better social behaviour may be associated with better emotion processing, verbal learning and reasoning ability. Better social problem solving may be associated with better attention, working memory, verbal learning and reasoning ability. Better social skills may be associated with better attention, visual learning, reasoning ability and verbal learning.

• Low to moderate quality evidence suggests increased social perception and a stable attribution style may improve community functioning and social behaviour.

• Low to moderate quality evidence suggests people with deficit schizophrenia (predominately negative symptoms) may show poorer social cognition than people with non-deficit schizophrenia (predominately positive symptoms).

• Low to moderate quality evidence suggests people with schizophrenia may show more impaired psychosocial functioning compared to people with bipolar disorder.
Chan R, Li H, Cheung E. and Gong Q-Y.

**Impaired facial emotion perception in schizophrenia: A meta-analysis**

*Psychiatry Research* 2010. 178: 381-390

[View review abstract online](#)

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Facial emotional perception and non-emotional facial or age recognition (control task) in people with schizophrenia vs. healthy controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary of evidence</td>
<td>Moderate quality evidence (inconsistent, precise, direct) with a medium to large effect size suggests that, compared to controls, people with schizophrenia may perform more poorly on facial emotion perception, including identification and discrimination, as well as on non-emotional facial recognition tasks. Performance on facial emotion perception may be moderated by severity of negative symptoms and a longer duration of illness. Performance on non-emotional recognition tasks may be moderated by severity of positive symptoms and longer duration of the illness</td>
</tr>
</tbody>
</table>

### Facial emotional perception

Large to moderate effect sizes suggest that people with schizophrenia performed significantly worse than healthy controls on both facial emotion perception and facial recognition tasks

28 studies, N = 1820

_Facial emotion perception:_ $d = -0.85$, 95%CI -1.04 to -0.66

$Q = 97.57$, $p < 0.001$

_Facial emotion perception control task:_ $d = -0.70$, 95%CI -0.86 to -0.54

$Q = 69.79$, $p < 0.001$

Random effects model

Subgroup analyses demonstrated significant impairments in both emotion identification and discrimination, in additional to facial recognition tasks

_Facial emotion identification:_ 21 studies, N = 1354, $d = -1.03$, 95%CI -1.29 to -0.78

$Q = 88.50$, $p < 0.001$

_Identification control task:_ $d = -0.94$, 95%CI -1.15 to -0.72

$Q = 67.56$, $p < 0.001$
Facial emotion discrimination: 16 studies, N = 1028, d = -0.81, 95%CI -0.99 to -0.64  
Q = 25.98, p < 0.05  

Discrimination control task: d = -0.78, 95%CI -1.00 to -0.55  
Q = 67.05, p < 0.001

Moderator analyses suggest that greater negative symptom severity (measured by PANSS) showed a significant association with poorer facial emotion perception. The results also suggest that increasing duration of illness (years) showed a trend-level (p < 0.10) positive association with poorer facial emotion perception.

Negative symptoms (PANSS): 7 studies, d = -1.11, 95%CI -1.63 to -0.60, p < 0.001, Q = 46.64  
Duration of the illness (years): 16 studies, d = -0.85, 95%CI -1.11 to -0.59, p = 0.06, Q = 3.66

No significant association was reported between facial emotion perception and medication, gender, negative symptoms (measured by SANS), and positive symptoms (measured by the PANSS or SAPS).

Subgroup analyses suggest greater positive symptom severity (measured by PANSS) and longer duration of the illness (years) were significantly associated with poorer performance on facial recognition tasks

Positive symptoms (PANSS): 7 studies, d = -0.70, 95%CI -1.08 to -0.31, p < 0.001, Q = 24.98  
Duration of the illness (years): 16 studies, d = -0.70, 95%CI -0.94 to -0.46, p < 0.001, Q = 17.36

No association was reported with medication, gender, negative symptoms (measured by PANSS or SANS), and positive symptoms (measured by SAPS).

<table>
<thead>
<tr>
<th>Consistency in results†</th>
<th>Inconsistent for group comparisons, unable to assess moderator analyses</th>
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<tbody>
<tr>
<td>Precision in results§</td>
<td>Precise</td>
</tr>
<tr>
<td>Directness of results¶</td>
<td>Direct</td>
</tr>
</tbody>
</table>

Christensen, T.  
The influence of neurocognitive dysfunctions on work capacity in schizophrenia patients: a systematic review of the literature  

View review abstract online
Comparison | Association between social skills and work capacity and cognitive performance, as well as symptom severity in people with schizophrenia  
Note: work capacity is the obtain and maintain competitive work and work behaviours and skills  

Summary of evidence | Low quality evidence (direct, unable to assess consistency or precision, small sample) is unable to ascertain any relationship between emotional perception and work functioning  

| Emotional processing  
1 study (N = 94) reported that poor emotional perception was associated with worse work functioning  
Consistency | Unable to assess  
Precision | Unable to assess  
Directness | Direct  

Cohen A, Saperstein A, Gold J, Kirkpatrick B, Carpenter W, and Buchanan R.  
Neuropsychology of the deficit syndrome: New data and meta-analysis of findings to date  
View review abstract online  

Comparison | Social cognition in people with deficit schizophrenia (predominantly negative symptoms) vs. people with non-deficit schizophrenia  

Summary of evidence | Low to moderate quality evidence (direct, unable to assess consistency or precision unclear sample) suggests people with deficit schizophrenia may show poorer social cognition than people with non-deficit schizophrenia  

Social cognition
A medium effect size suggests greater social cognition impairment in people with deficit schizophrenia compared with non-deficit schizophrenia

2 studies, ES = 0.56, 95%CI -2.09 to 3.21 Sample sizes, Q and p-values are not reported

<table>
<thead>
<tr>
<th>Consistency</th>
<th>Unable to assess</th>
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<tr>
<td>Precision</td>
<td>Unable to assess</td>
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<tr>
<td>Directness</td>
<td>Direct</td>
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</table>

*Cohen, A.S. and Minor, K.S.*

**Emotional experience in patients with schizophrenia revisited: Meta-analysis of laboratory studies**

*Schizophrenia Bulletin 2010. 36(1): 143-150*

[View review abstract online](#)

**Comparison**

Emotional response following positive, negative or neutral stimuli in people with schizophrenia vs. controls

Note: “Positive” refers to stimuli generating pleasure. “Negative” refers to stimuli evoking avoidant, threat, sadness, or other negative emotional states. “Neutral” refers to stimuli that are neither positive nor negative. Hedonic and aversive emotions refer to the emotional state following stimuli presentation. “Bipolar ratings” refers to a subjective rating scale set up with hedonic and aversive emotions on opposing ends of a spectrum.

**Summary of evidence**

High quality evidence (direct, consistent, precise) suggests that people with schizophrenia experienced greater aversion to positive and neutral stimuli than controls; as well as greater hedonic response to negative stimuli. Both people with schizophrenia and controls showed similar hedonic responses to positive and neutral stimuli; and similar aversive responses to negative stimuli

Positive stimuli

A medium effect size suggests people with schizophrenia experienced greater aversion to positive
**Signs and Symptoms – Social Cognition**

**stimuli, compared with controls**

11 studies, N = 605 (322 schizophrenia, 283 controls)

\[ d = 0.72, \text{95\%CI 0.53 to 0.91, no p-value reported, Q = 5.36} \]

A small effect size suggests people with schizophrenia experienced greater aversion (lower ‘bipolar ratings’) to positive stimuli, compared with controls

12 studies, N = 627 (340 schizophrenia, 287 controls)

\[ d = -0.33, \text{95\%CI -0.57 to -0.10, no p-value reported, Q = 10.68} \]

No difference was reported in hedonic response to positive stimuli between people with schizophrenia and controls

14 studies, N = 770 (412 schizophrenia, 358 controls)

\[ d = -0.16, \text{95\%CI -0.40 to 0.07, no p-value reported, Q = 13.72} \]

**Negative stimuli**

A small effect size suggests people with schizophrenia experienced greater hedonic response to negative stimuli, compared with controls

10 studies, N = 544 (292 schizophrenia, 252 controls)

\[ d = 0.28, \text{95\%CI 0.03 to 0.59, no p-value reported, Q = 10.86} \]

No difference was reported in aversive response to negative stimuli between people with schizophrenia and controls

9 studies, N = 697 (357 schizophrenia, 340 controls)

\[ d = 0.24, \text{95\%CI -0.03 to 0.45, no p-value reported, Q = 8.56} \]

No difference was reported in ‘bipolar ratings’ to negative stimuli between people with schizophrenia and controls

12 studies, N = 594 (307 schizophrenia, 287 controls)

\[ d = 0.12, \text{95\%CI -0.12 to 0.36, no p-value reported, Q = 11.80} \]

**Neutral Stimuli**

A medium effect size suggests that people with schizophrenia experienced greater aversion to neutral stimuli, compared with controls

7 studies, N = 321 (176 schizophrenia, 145 controls)
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\[ d = 0.64, \text{ 95\%CI 0.34 to 0.93, no } p\text{-value reported, } Q = 4.76 \]

No difference was reported in hedonic response to neutral stimuli between people with schizophrenia and controls

7 studies, \( N = 321 \) (176 schizophrenia, 145 controls)

\[ d = 0.25, \text{ 95\%CI -0.25 to 0.73, no } p\text{-value reported, } Q = 6.24 \]

No difference was reported in ‘bipolar ratings’ to neutral stimuli between people with schizophrenia and controls

9 studies, \( N = 452 \) (246 schizophrenia, 206 controls)

\[ d = 0.07, \text{ 95\%CI -0.15 to 0.29, no } p\text{-value reported, } Q = 8.01 \]

Subgroup analysis suggests stimulus type (eg. film, pictures, silly face), gender and medication did not significantly affect emotion induction

<table>
<thead>
<tr>
<th>Consistency</th>
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<tbody>
<tr>
<td>Precision</td>
<td>Precise</td>
</tr>
<tr>
<td>Directness</td>
<td>Direct</td>
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*Couture, S.M., Penn, D.L., Roberts, D.L.*

**The Functional Significance of Social Cognition in Schizophrenia: A Review**


[View review abstract online](#)

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Effect of deficits in various social cognition domains on functional outcome in schizophrenia spectrum disorders</th>
</tr>
</thead>
</table>

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[405 Liverpool Street, Darlinghurst, Sydney NSW 2010, Australia](#)  
Tel: (02) 9295 8688  Email: [library@schizophreniaresearch.org.au](mailto:library@schizophreniaresearch.org.au)  
Web: [www.schizophreniaresearch.org.au](http://www.schizophreniaresearch.org.au)  
To donate, phone the Institute or visit [www.schizophreniaresearch.org.au](http://www.schizophreniaresearch.org.au)
Summary of evidence | Low to moderate quality evidence (direct, large sample size, unable to assess consistency, precision) suggests increased social perception may improve community function and social behaviour, as well as social problem solving. Better emotional perception may also improve community function and social behaviour and social skills. A stable attribution style may increase community function and social behaviour

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### Social perception (SP) and functional outcome

*Social perception is a person’s ability to perceive social cues from behaviour in a social context, and incorporates knowledge of social rules and conventions*

Three of four studies (N = 207) reported a significant medium to large positive relationship between SP and social behaviour in treatment settings, with increases in SP correlating positively with improved social behaviour.

Three studies (N = 116) reported a significant small to medium positive relationship between increased SP and better community functioning, and one study (N = 162) showed a small effect, that SP could predict inpatient or outpatient status, with increased SP predicting higher outpatient status.

Three studies of inpatients (N = 158) reported a significant medium to large positive effect associating increased SP with increased social problem solving skills.

Two studies (N = 172) reported a significant medium positive association between increased SP and increased social skills, while two studies reported no association (N = 75).

### Emotional perception (EP) and functional outcome

*Emotional perception is the ability to infer emotional information from facial expressions and vocal inflections*

Four of six studies (N = 126) reported a significant medium to large positive relationship between increased EP and better social behaviour in treatment settings.

Three of four studies (N = 131) showed a significant small relationship between increased EP and better social skills.

Three studies (N = 260) found a consistent significant medium relationship between improved EP and greater community function, including work function and independent living scales.

### Attributional Style (AS) and functional outcome
Attributional style refers to a person’s tendencies toward explaining the cause of events (blaming people versus situations)

One study (N = 40) reported a significant, medium effect that stable attributions were related to better community function

One study (N = 29) found that hostile attributional bias had a significant small relationship with aggressive inpatient behaviour

Consistency  Unable to assess
Precision    Unable to assess
Directness   Direct

Daban C., Martinez-Aran A., Torrent C., Tabarès-Seisdedos R., Balanzá-Martínez V., Salazar-Fraile J., Selva-Vera G. Vieta E.

Specificity of cognitive deficits in bipolar disorder versus schizophrenia: A systematic review

Psychotherapy and Psychosomatics 2006. 75: 72-84

Comparison | Cognitive performance in people with schizophrenia vs. people with bipolar disorder

Summary of evidence | Low to moderate quality evidence (unable to assess consistency or precision, medium sample) suggests people with schizophrenia may show impaired psychosocial functioning compared to people with bipolar disorder

Psychosocial functioning

2 studies (N = 198) reported more impaired psychosocial functioning in people with schizophrenia compared to people with bipolar disorder

Consistency  Unable to assess
Precision    Unable to assess
Directness   Direct
**Signs and Symptoms – Social Cognition**

Fett A.K., Viechtbauer W., Dominguez M., Penn D., van Os J. and Krabbendam L.

**The relationship between neurocognition and social cognition with functional outcomes in schizophrenia: A meta-analysis**

*Neuroscience and Biobehavioural Reviews, 2011. 35: 573-588*

View review abstract online

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Association between functional outcomes (community function, social behaviour, social problem solving, social skills) and performance on various cognitive domains in patients with schizophrenia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary of evidence</td>
<td>High quality evidence (direct, mostly consistent, mostly precise) shows that increased community functioning has a small to medium size association with better performance on Theory of Mind, emotion processing, information processing, verbal learning, working memory, and reasoning tasks. Improved social behaviour is associated with better emotion processing, verbal learning, and reasoning ability. Greater problem solving ability showed associations with better attention, working memory, verbal learning, and reasoning ability. Better social skills were associated with improved attention, visual learning, reasoning ability and verbal learning</td>
</tr>
</tbody>
</table>

**Community functioning (work performance, social interaction)**

**Significant positive association between increased performance on ToM task and greater community functioning**

- 3 studies, N = 114
- Estimated average correlation = 0.48, 95%CI 0.32 to 0.61, p < 0.001
- Q = 0.81, I² = 1%, non-significant (p value not reported)

**Significant positive association between increased performance on emotional perception and processing tasks and greater community functioning**

- 5 studies, N = 378
- Estimated average correlation = 0.31, 95%CI 0.21 to 0.40, p < 0.001
- Q = 1.67, I² = 0%, non-significant (p value not reported)
Significant positive association between increased performance on attention tasks and greater community functioning

9 studies, N = 481
Estimated average correlation = 0.16, 95%CI 0.04 to 0.27, p = 0.01
Q = 13.15, \( I^2 = 38.17\% \), non-significant (p value not reported)

Significant positive association between increased performance on a processing speed task and greater community functioning

8 studies, N = 465
Estimated average correlation = 0.25, 95%CI 0.13 to 0.37, p < 0.001
Q = 12.36, \( I^2 = 42.94\% \), non-significant (p value not reported)

Significant positive association between increased performance on WM task and greater community functioning

7 studies, N = 495
Estimated average correlation = 0.22, 95%CI 0.05 to 0.38, p = 0.01
Q = 18.89, \( I^2 = 69.30\% \), significant (p value not reported)

Significant positive association between increased performance on verbal learning tasks and greater community functioning

17 studies, N = 1125
Estimated average correlation = 0.26, 95%CI 0.15 to 0.37, p < 0.001
Q = 69.54, \( I^2 = 71.65\% \), significant (p value not reported)

Significant positive association between increased performance on visual learning task and greater community functioning

6 studies, N = 230
Estimated average correlation = 0.20, 95%CI 0.07 to 0.33, p = 0.003
Q = 2.90, \( I^2 = 0\% \), non-significant (p value not reported)

Significant positive association between increased performance on reasoning and problem solving tasks and greater community functioning

16 studies, N = 901
Estimated average correlation = 0.19, 95%CI 0.12 to 0.26, p < 0.001
Q = 16.19, \( I^2 = 9.95\% \), non-significant (p value not reported)

Social behaviour
Significantly positive association between increased performance on emotional perception and processing tasks and improved social behaviour

- 6 studies, N = 265
- Estimated average correlation = 0.22, 95% CI 0.10 to 0.34, p < 0.001
- Q = 3.08, I² = 0%, non-significant (p value not reported)

No association between performance on attention tasks and social behaviour

- 4 studies, N = 234
- Estimated average correlation = 0.19, 95% CI -0.11 to 0.45, p = 0.21
- Q = 14.95, I² = 74.16%, significant (p value not reported)

Significant positive association between increased performance on verbal learning tasks and improved social behaviour

- 4 studies, N = 253
- Estimated average correlation = 0.32, 95% CI 0.15 to 0.47, p < 0.001
- Q = 4.84, I² = 39.22%, non-significant (p value not reported)

Significant positive association between better performance on visual learning tasks and improved social behaviour

- 4 studies, N = 122
- Estimated average correlation = 0.30, 95% CI 0.10 to 0.47, p = 0.002
- Q = 3.47, I² = 11.76%, non-significant (p value not reported)

Significantly positive association between increased performance on a reasoning and problem solving tasks and improved social behaviour

- 5 studies, N = 257
- Estimated average correlation = 0.23, 95% CI 0.11 to 0.35, p < 0.001
- Q = 2.06, I² = 0%, non-significant (p value not reported)

Social problem solving

Significantly positive association between increased performance on attention tasks and greater social problem solving

- 3 studies, N = 100
- Estimated average correlation = 0.25, 95% CI 0.07 to 0.47, p = 0.007
- Q = 1.45, I² = 0%, non-significant (p value not reported)
## Significant positive association between increased performance on WM task and greater social problem solving

- 4 studies, N = 127
- Estimated average correlation = 0.25, 95%CI 0.07 to 0.41, \( p = 0.007 \)
- \( Q = 0.29, I^2 = 0\% \), non-significant (\( p \) value not reported)

## Significant positive association between increased performance on verbal learning tasks and greater social problem solving

- 4 studies, N = 117
- Estimated average correlation = 0.26, 95%CI 0.07 to 0.43, \( p = 0.003 \)
- \( Q = 0.44, I^2 = 0\% \), non-significant (\( p \) value not reported)

## Significant positive association between increased performance on a reasoning and problem solving tasks and greater social problem solving

- 3 studies, N = 90
- Estimated average correlation = 0.29, 95%CI 0.08 to 0.47, \( p = 0.008 \)
- \( Q = 0.73, I^2 = 0\% \), non-significant (\( p \) value not reported)

### Social skills

## Significant to large positive association between increased performance on attention tasks and better social skills

- 3 studies, N = 119
- Estimated average correlation = 0.39, 95%CI 0.22 to 0.53, \( p < 0.001 \)
- \( Q = 0.22, I^2 = 0\% \), non-significant (\( p \) value not reported)

## Significant positive association between increased performance on verbal learning task and better social skills

- 7 studies, N = 250
- Estimated average correlation = 0.18, 95%CI 0.06 to 0.31, \( p = 0.005 \)
- \( Q = 8.54, I^2 = 0\% \), non-significant (\( p \) value not reported)

## Significant positive association between increased performance on visual learning task and better social skills

- 4 studies, N = 149
- Estimated average correlation = 0.28, 95%CI 0.07 to 0.46, \( p = 0.008 \)
- \( Q = 5.22, I^2 = 30.81\% \), non-significant (\( p \) value not reported)
Significant association between improved performance on a reasoning and problem solving tasks and better social skills

3 studies, N = 119
Estimated average correlation = 0.34, 95%CI 0.17 to 0.50, p < 0.001
Q = 1.04, I² = 0%, non-significant (p value not reported)

<table>
<thead>
<tr>
<th>Consistency</th>
<th>Consistent for all outcomes except community function – working memory and social behaviour – attention</th>
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<tbody>
<tr>
<td>Precision</td>
<td>Precise for all outcomes except social behaviour – attention</td>
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<tr>
<td>Directness</td>
<td>Direct</td>
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</tbody>
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Hoekert, M. Kahn, R.S. Pijnenborg, M. and Aleman, A.

Impaired recognition and expression of emotional prosody in schizophrenia: Review and meta-analysis

View review abstract online

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Emotional prosody (tone of voice perception) in people with schizophrenia vs. controls</th>
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</thead>
<tbody>
<tr>
<td>Summary of evidence</td>
<td>Low quality evidence (direct, inconsistent, imprecise, small samples) is unable to ascertain the difference in emotional prosody expression and perception in people with schizophrenia compared with controls</td>
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</tbody>
</table>

**Emotional Prosody**

Large effects size suggests significantly poorer perception of emotional prosody in people with schizophrenia compared with controls

17 studies, N = 623, d = -1.240, 95%CI -0.42 to -2.46
Q = 82.0, p < 0.0005

Large effect size suggests poorer expression of emotional prosody in people with schizophrenia compared with controls, however results are not significant
### Signs and Symptoms – Social Cognition

7 studies, $N = 186$, $d = -1.11$, 95%CI 0.87 to -2.0

$Q = 44.8$, $p < 0.0005$

Subgroup analysis suggests no effect of patient status, age, duration of the illness, medication status, group size, level of education or task complexity.

<table>
<thead>
<tr>
<th>Consistency</th>
<th>Inconsistent</th>
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<tbody>
<tr>
<td>Precision</td>
<td>Imprecise</td>
</tr>
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<td>Directness</td>
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**Kohler C, Walker J, Martin E, Healey K. and Moberg P.**

**Face emotion perception in schizophrenia: A meta-analytic review**

**Schizophrenia Bulletin** 2010. 36(5): 1009-1019

[View review abstract online](#)

**Comparison**  
Facial emotion perception in people with schizophrenia vs. controls

**Summary of evidence**  
Moderate quality evidence (direct, precise, inconsistent) suggests impaired facial emotion perception in people with schizophrenia compared to controls. The results also suggest that impairments in facial emotion perception may be associated with greater symptom severity, first-generation medications, inpatient status, later age of onset, and higher proportion of males

**Facial emotion perception**

A large effect size suggests overall impaired facial emotion identification and differentiation in people with schizophrenia compared to controls

Number of studies is unclear, $N = 3822$, $d = -0.91$, 95%CI -0.97 to -0.84

$Q_B = 295.7$, $p < 0.001$

**Symptoms**

A significant association was reported between impaired facial emotion perception and greater
Signs and Symptoms – Social Cognition

symptom severity, according to SANS, SAPS scores and BPRS

SANS: 20 studies, $Z = -4.13, p < 0.001$
SAPS: 18 studies, $Z = -4.48, p < 0.001$
BPRS: 6 studies, $Z = -3.08, p = 0.002$

No association was found for PANSS positive, negative or total symptom scores.

### Medication groups

Significant between-group comparison suggests impaired emotion perception in unmedicated, medicated and mixed groups. The mixed group showed significantly less impairment than both other groups

- **Unmedicated**: 2 studies, $d = -1.41$, 95%CI -0.9 to -1.81
- **Medicated**: 57 studies, $d = -1.00$, 95%CI -1.10 to -0.86
- **Mixed group**: 20 studies, $d = -0.73$, 95%CI -0.89 to -0.58
  
  $Q_B = 11.76, p < 0.01$

The evidence suggests significantly greater impairment in people receiving first generation antipsychotics compared to both second generation antipsychotics and the mixed group

- **First generation antipsychotics**: 25 studies, $d = -1.10$, 95%CI -1.30 to -0.91
- **Second generation antipsychotics**: 7 studies, $d = -0.63$, 95%CI -0.87 to -0.38
- **Mixed group**: 22 studies, $d = -0.82$, 95%CI -1.00 to -0.62
  
  $Q_B = 9.35, p < 0.01$

No association between facial emotion perception and chlorpromazine-equivalent dose ($p = 0.10$)

A later age of onset was significantly associated with greater impairment (16 studies, $p = 0.006$), although duration of illness did not show an association. Increasing age was significantly associated with impaired emotion perception in both schizophrenia and control groups ($p < 0.01$)

Gender also showed significant influence, impairment was lower with a higher proportion of male controls ($p < 0.001$). No association was reported with the number of hospitalisations, level of education, or percentage Caucasian

Subgroup analysis suggests inpatients were more impaired than both the outpatients ($Q_B = 16.01, p < 0.001$) and the mixed group ($Q_B =10.57, p < 0.01$). No significant difference was reported between outpatients and mixed group.

- **Inpatients**: 38 studies, $d = -1.20$, 95%CI -1.30 to -1.10
- **Outpatients**: 26 studies, $d = -0.70$, 95%CI -0.80 to -0.60
- **Mixed group**: 8 studies, $d = -0.58$, 95%CI -0.76 to -0.39
Subgroup analysis showed no effect of diagnosis on emotion perception, with no significant difference between schizophrenia alone and schizophrenia spectrum illnesses:

- **Schizophrenia**: 71 studies, $d = -0.98$, 95%CI -1.12 to -0.85
- **Schizophrenia Spectrum**: 15 studies, $d = -0.85$, 95%CI -1.09 to -0.61

$$Q_B = 0.90, p = 0.34$$

Subgroup analysis suggests no difference between task type:

- **Facial affect identification**: 59 studies, $d = -0.89$, 95%CI -1.05 to -0.75
- **Facial affect differentiation**: 27 studies, $d = -1.09$, 95%CI -1.29 to -0.89

$$Q_B = 2.46, p = 0.117$$

<table>
<thead>
<tr>
<th>Consistency</th>
<th>Inconsistent for overall comparison, unable to assess subgroups</th>
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<tbody>
<tr>
<td>Precision</td>
<td>Precise</td>
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<tr>
<td>Directness</td>
<td>Direct</td>
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**Mesholam-Gately R., Giuliano A., Goff K., Faraone S. and Seidman L.**

**Neurocognition in first-episode schizophrenia: a meta analytic review.**

*Neuropsychology 2009. 23(3): 315-335*

[View review abstract online](#)

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<th>Comparison</th>
<th>Social cognition in people with first-episode schizophrenia vs. controls</th>
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<td>Summary of evidence</td>
<td>Moderate quality evidence (direct, large sample, inconsistent, precise) shows a medium effect of poorer social cognition in people with first-episode schizophrenia compared to controls</td>
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**Social cognition**

Medium effect size suggests people with first-episode schizophrenia showed significantly poorer social cognition than controls

- 5 studies, $N = 289$, $d = -0.77$, 95%CI -1.01 to -0.54, $p < 0.001$
- $Q = 56.59$, $p < 0.001$
Larger effect size was associated with increased mean age of controls ($p < 0.001$), as well as with recency of publication ($p = 0.01$), and the percentage of males in the patient group ($p < 0.04$). Smaller effect size was associated with studies conducted outside the US ($p = 0.001$), with a higher proportion of males in the control group ($p < 0.001$), and for those studies with a higher proportion of patients receiving antipsychotics ($p < 0.02$).

<table>
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Explanation of acronyms

AS = Attributional Style, BPRS = Brief Psychiatric Rating Scale, CI = Confidence Interval, $d$ = Cohen’s $d$ and $g$ = Hedges’ $g$ = standardised mean differences (see below for interpretation of effect size), EP = Emotional Perception, ES = effect size, FGA = first generation antipsychotics, $I^2$ = the percentage of the variability in effect estimates that is due to heterogeneity rather than sampling error (chance), N = number of participants, $p$ = statistical probability of obtaining that result ($p < 0.05$ generally regarded as significant), PANSS = Positive and Negative Symptom Scale, $Q = Q$ statistic for the test of heterogeneity, $Q_w$ = test for within group differences (heterogeneity in study results within a group of studies – measure of study consistency), $Q_B$ = test for between group differences (heterogeneity between groups of studies for an outcome of interest), SANS = Scale for the Assessment of Negative Symptoms, SAPS = Scale for the Assessment of Positive Symptoms, SGA = second generation antipsychotics, SP = Social Perception, $vs$ = versus, $Z = z$-transformation of the effect size (standardised)
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 which 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[17].

† 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 which are correctly identified (100% sensitivity = correct identification of all actual positives) and specificity is the proportion of negatives which 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) which 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[17].

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 to large effect is considered if RR > 2 or < 0.5 and a large effect if RR > 5 or < 0.2[18]. InOR stands for logarithmic OR where a lnOR of 0
Signs and Symptoms – Social Cognition

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 between variables. They can provide an indirect indication of prediction, but do not confirm causality due to possible and often unforeseen 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) which 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[17]:

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

§ 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[18].

‖ 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 which 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.

This topic is yet to be reviewed by a content expert.
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References