Introduction

Psychomotor functioning refers to a wide variety of actions involving physical movement related to conscious cognitive processing. Psychomotor ability may be measured by accuracy or speed (reaction time). Examples of psychomotor tests include the Grooved Pegboard test\(^1\)\(^-\)\(^4\), and the Purdue Pegboard test\(^5\) which measure visuo-motor coordination. The Finger Tapping test\(^1\)\(^-\)\(^4\) requires study participants to place their dominant hand face-down and tap as quickly as possible. The task is repeated with the non-dominant hand and assesses motor speed, manual dexterity and lateralization. The Digit Symbol Substitution test\(^6\)\(^,\)\(^7\) involves paired numbers and symbols. Participants are shown several numbers and asked to write the missing corresponding symbols as quickly as possible, measuring motor ability and attention\(^6\). The Pursuit Rotor Motor task\(^5\) presents participants with a turntable with a dot in the center which they must hold with a flexible metal wand as the turntable spins, measuring motor coordination and learning. The Star Mirror Tracing task\(^5\) asks participants to trace a star while only looking at their hand in the reflection of a mirror, assessing visuo-motor learning.

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. Due to the high volume of systematic reviews we have now limited inclusion to systematic meta-analyses. Where no systematic meta-analysis exists for a topic, systematic reviews without meta-analysis are included for that topic. As part of a wider search for all topics included in the library, reviews on psychomotor ability for 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\(^8\). 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%. Due to the increased number of reviews published since 2014, reviews reporting less than 50% of items have been excluded from the library, prior to this date we excluded reviews reporting less than 33% of items. 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).

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 psychomotor ability in schizophrenia. We found 17 systematic reviews that met our inclusion criteria.1-3, 6, 7, 10-21

Click on review ID for a link to the review’s abstract.

See PRISMA checklists for assessment of reporting transparency.

Conclusions

• Compared to controls, moderate to high quality evidence suggests poorer psychomotor ability in people with schizophrenia, including people with first-episode schizophrenia or early onset schizophrenia.

• Compared to people with affective psychoses, moderate quality evidence suggests a small effect of lower psychomotor and mental speed in people with schizophrenia. No difference in fine motor skills is reported from high quality evidence.

• Moderate to high quality evidence suggests a large effect of poorer motor performance in people with schizophrenia and antisocial traits compared to people without schizophrenia with antisocial traits.

• In general, high quality evidence suggests greater improvement in motor skills in patients receiving second generation antipsychotics compared to first generation antipsychotics. Specifically, moderate to high quality evidence suggests patients receiving clozapine may show improvement pre- to post-treatment, however patients receiving olanzapine, quetiapine, risperidone or haloperidol show no improvement.

• Low to moderate quality evidence suggests that lower levels of work performance and behaviour are associated with poor psychomotor ability in people with schizophrenia.

• High quality evidence suggests a small effect of better psychomotor skills in people with a psychotic disorder and a substance use disorder than people with a psychotic disorder without a substance use disorder.
## Signs and Symptoms – Psychomotor Ability

**Bora E, Yucel M, and Pantelis C.**

**Cognitive functioning in schizophrenia, schizoaffective disorder and affective psychoses: meta-analytic study**


View review abstract online

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Cognitive functioning in people with schizophrenia vs. people with affective psychosis or schizoaffective disorder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Note: the schizophrenia group had more males, with a younger mean age and with fewer years of education, which may account for any observed effects</td>
<td></td>
</tr>
</tbody>
</table>

| Summary of evidence | Moderate quality evidence (direct, precise, inconsistent) suggests a small effect of lower performance on psychomotor speed tasks in people with schizophrenia compared to people with affective psychosis or schizoaffective disorder |

### Psychomotor speed

A significant, small effect suggests worse psychomotor speed in people with schizophrenia compared to people with affective psychosis or schizoaffective disorder

17 studies (N = not reported), \( d = 0.24, 95\% CI 0.07 \) to 0.42, \( p = 0.0055, Q_w, p = 0.001 \)

Subgroup analysis shows that this effect is significant for both comparisons with affective psychosis and with schizoaffective psychosis

Schizophrenia vs. affective psychosis: 11 studies, \( d = 0.27, 95\% CI 0.03 \) to 0.51, \( p = 0.03, Q_w p = 0.001 \)

Schizophrenia vs. schizoaffective disorder: 8 studies, \( d = 0.22, 95\% CI 0.02 \) to 0.43, \( p = 0.03, Q_w p = 0.05 \)

Subgroup analysis shows that the effect sizes were non-significant when using only gender-matched studies (statistics not reported)

### Results for individual psychomotor speed tasks

Verbal fluency (authors report that this task is highly correlated with mental speed tasks, so is indicative of mental speed) – trend for worse performance in schizophrenia for all comparisons

Schizophrenia vs. affective psychosis/schizoaffective: 9 studies, \( d = 0.22, 95\% CI -0.03 \) to 0.48, \( p = 0.09, Q_w p = 0.002 \)

Schizophrenia vs. affective psychosis: 6 studies, \( d = 0.29, 95\% CI -0.01 \) to 0.59, \( p = 0.06, Q_w p = \)
Schizophrenia vs. schizoaffective disorder: 5 studies, $d = 0.32, 95\%CI 0.00$ to $0.64, p = 0.05, Q_W p = 0.15$

_Mental speed - worse performance in schizophrenia for all comparisons_

Schizophrenia vs. affective psychosis/schizoaffective: 12 studies, $d = 0.26, 95\%CI 0.03$ to $0.49, p < 0.05, Q_W p < 0.0001$

Schizophrenia vs. affective psychosis: 8 studies, $d = 0.26, 95\%CI -0.10$ to $0.61, p = 0.15, Q_W p < 0.0001$

Schizophrenia vs. schizoaffective disorder: 5 studies, $d = 0.24, 95\%CI 0.01$ to $0.47, p = 0.04, Q_W p = 0.02$

_Meta-regression showed that schizophrenia samples with more severe symptoms, fewer years of education and younger age showed the greatest impairments compared to people with schizoaffective/affective psychosis_

Negative symptoms: 6 studies, $B = 0.39, SE = 0.09, p < 0.001$

Positive symptoms: 20 studies, $B = 0.59, SE = 0.29, p = 0.04$

Fewer years of education (number of studies not reported): $B = 0.69, SE = 0.32, p = 0.03$

Younger age: 10 studies, $B = 0.17, SE = 0.19, p = 0.05$

### Consistency in results

<table>
<thead>
<tr>
<th>Consistency in results</th>
<th>Inconsistent</th>
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### Precision in results

<table>
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<tr>
<th>Precision in results</th>
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### Directness of results

<table>
<thead>
<tr>
<th>Directness of results</th>
<th>Direct</th>
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</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

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Association between work capacity and psychomotor functioning/speed performance in people with schizophrenia</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Note: work capacity is the obtain and maintain competitive work and work behaviours and skills</td>
</tr>
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</table>
Signs and Symptoms – Psychomotor Ability

<table>
<thead>
<tr>
<th>Summary of evidence</th>
<th>Low to moderate quality evidence (direct, unable to assess consistency or precision) suggests that lower levels of work performance and behaviour are associated with poor psychomotor ability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Psychomotor ability</td>
<td>2 studies (N = 208) reported that poor psychomotor functioning/speed was associated with worse work performance and behaviour</td>
</tr>
<tr>
<td>Consistency</td>
<td>Unable to assess</td>
</tr>
<tr>
<td>Precision</td>
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</tr>
<tr>
<td>Directness</td>
<td>Direct</td>
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</tbody>
</table>

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](#)

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Psychomotor ability in people with deficit schizophrenia vs. people with non-deficit schizophrenia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary of evidence</td>
<td>Low quality evidence (direct, unable to assess consistency or precision, unclear sample) is unable to determine psychomotor ability in people with schizophrenia vs. deficit subtypes</td>
</tr>
<tr>
<td>Psychomotor ability</td>
<td>Authors report that two studies found poorer psychomotor ability in people with deficit schizophrenia when compared to controls. People with the deficit subtype generally performed worse on psychomotor tasks than did patients with non-deficit schizophrenia</td>
</tr>
<tr>
<td></td>
<td>Tests included grooved pegboard, finger tapping and stroop colour. Sample sizes, effect sizes, Q and p-values are not reported</td>
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Signs and Symptoms – Psychomotor Ability

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Dickinson D. Ramsey M.E. and Gold J.M.

Overlooking the Obvious: A meta-analytic comparison of digit symbol coding tasks and other cognitive measures in schizophrenia

Archives of General Psychiatry 2007. 64: 532-542

View review abstract online

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<td>Moderate quality (direct, unable to assess consistency, precise) suggests a large effect size of poorer performance on grooved pegboard tasks (dominant and non-dominant); and a medium effect of poorer performance on finger tapping tasks (dominant and non-dominant) compared to controls</td>
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<td><strong>Large effect size suggests people with schizophrenia showed poorer motor speed performance compared to controls on tasks including:</strong></td>
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<tr>
<td>Grooved pegboard dominant: 7 studies, N = 728 (483 schizophrenia, 245 controls)</td>
<td>g = -0.92, SE = 0.08, 95%CI -1.09 to -0.75</td>
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<td>Grooved pegboard non-dominant: 6 studies, N = 648 (437 schizophrenia, 211 controls)</td>
<td>g = -0.98, SE = 0.10, 95%CI -1.17 to -0.79</td>
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<td><strong>Medium effect size suggests people with schizophrenia showed poorer motor speed performance compared to controls on tasks including:</strong></td>
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<tr>
<td>Finger tapping dominant: 9 studies, N = 1073 (571 schizophrenia, 502 controls)</td>
<td>g = -0.68, SE = 0.11, 95%CI -0.90 to -0.46</td>
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Signs and Symptoms – Psychomotor Ability

Random effects model

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Donoghue K, Doody GA

Effect of Illegal Substance Use on Cognitive Function in Individuals With a Psychotic Disorder, A Review and Meta-Analysis

Neuropsychology 2012; 26 (6): 785–801
[View review abstract online]

Comparison

Cognitive functioning in people with a psychotic disorder and a substance use disorder vs. people with a psychotic disorder without a substance use disorder

Summary of evidence

High quality evidence (consistent, precise, direct) suggests a small effect of better psychomotor skills in people with a psychotic disorder and a substance use disorder than people with a psychotic disorder without a substance use disorder

Cognitive functioning in people with a polysubstance use disorder

A significant small effect suggests people with a psychotic disorder and a polysubstance use disorder showed better psychomotor skills than people with a psychotic disorder without a substance use disorder

Attention and psychomotor: 8 studies (N = 513), $g = 0.295$, 95%CI 0.110 to 0.479, $p = 0.002$, $I^2 = 0\%$, $p = 0.780$

Cognitive functioning in people with a cocaine use disorder

A significant small effect suggests people with a psychotic disorder and a cocaine use disorder showed better psychomotor skills than people with a psychotic disorder without a substance use disorder

Attention and psychomotor: 5 studies (N = 236), $g = 0.326$, 95%CI 0.035 to 0.616, $p = 0.028$, $I^2 = 15\%$, $p = 0.316$

Cognitive functioning in people with a cannabis use disorder
Signs and Symptoms – Psychomotor Ability

A significant small effect suggests people with a psychotic disorder and a cannabis use disorder showed better psychomotor skills than people with a psychotic disorder without a substance use disorder.

*Attention and psychomotor*: 3 studies (N = 551), $g = 0.316$, 95%CI 0.144 to 0.488, $p < 0.001$, $I^2 = 0\%$, $p = 0.968$

**Consistency in results** | Consistent  
--- | ---  
**Precision in results** | Precise  
**Directness of results** | Direct

**Guilera G., Pino O., Gomez-Benito J. and Rojo J.E.**  
*Antipsychotic effects on cognition in schizophrenia: A meta-analysis of randomised control trials*

*The European Journal of Psychiatry* 2009. 23(2): 77-89

[View review abstract online](#)

**Comparison** | Psychomotor performance in people with schizophrenia on second generation antipsychotics vs. first generation antipsychotics
--- | ---  
**Summary of evidence** | Moderate to high quality evidence (direct, precise, large sample, unable to assess consistency) suggests greater psychomotor ability in people with schizophrenia receiving second-generation antipsychotics compared to those receiving first-generation antipsychotics

**Psychomotor ability**

A significantly small effect size showed greater psychomotor ability in people with schizophrenia receiving second-generation antipsychotics compared to those receiving first-generation antipsychotics.

5 RCT, N = 387, $g = 0.29$, 95%CI 0.11 to 0.47, $p < 0.01$

**Consistency** | Unable to assess  
--- | ---  
**Precision** | Precise
Signs and Symptoms – Psychomotor Ability

Irani F., Kalkstein S., Moberg E. and Moberg P.

Neuropsychological performance in older patients with schizophrenia: A meta-analysis of cross-sectional and longitudinal studies


View review abstract online

Comparison | Psychomotor performance in older people with schizophrenia (mean age 64 years)
Summary of evidence | Moderate quality evidence (direct, inconsistent or unable to assess consistency or precision) suggests that older people with schizophrenia may have poorer psychomotor performance than age-matched controls

Psychomotor skills

Authors report a large effect of poorer psychomotor performance in older people with schizophrenia compared to the age-matched control group

Number of studies, sample sizes, effect size, Q and p-values are not reported

Subgroup analysis suggests global cognition may be associated with age, sex, education, ethnicity, diagnosis, living status, age of onset/duration of illness and clinical symptoms

Consistency | Inconsistent for overall global cognition, unable to assess for psychomotor ability

Precision | Precise for overall global cognition. Unable to assess for psychomotor ability

Directness | Direct

Krabbendam L., Arts B., van Os J., Aleman A.

Cognitive functioning in patients with schizophrenia and bipolar disorder:
## A quantitative review

**Schizophrenia Research 2005. 80: 137-149**

*View review abstract online*

### Comparison

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

### Summary of evidence

Moderate quality evidence (inconsistent) suggests a medium effect of lower performance in mental speed in people with schizophrenia compared to people with bipolar disorder. No difference in fine motor skills is reported from high quality evidence.

### Psychomotor skills

**A significant, medium effect suggests people with schizophrenia showed more impaired performance on mental speed compared to people with bipolar disorder**

- Mental speed: 11 studies, \( N = 872 \), \( d = 0.50, 95\% CI 0.10 \) to 0.89, \( p = 0.01 \)
  
  \[ Q_w = 70.5, \ p < 0.001 \]

- But not on fine motor skills: 4 studies, \( N = 339 \), \( d = 0.06, 95\% CI -0.16 \) to 0.27, \( p = 0.61 \)
  
  \[ Q_w = 3.0, \ p = 0.39 \]

### Consistency

Consistent for fine motor skills

### Precision

Precise

### Directness

Direct

---

**Knowles E. David A. and Reichenberg A.**

**Processing speed deficits in schizophrenia: Reexamining the evidence**


*View review abstract online*

### Comparison

Digit symbol coding performance in people with schizophrenia vs. controls

### Summary of evidence

Moderate to high quality evidence (direct, inconsistent, precise,
Signs and Symptoms – Psychomotor Ability

<table>
<thead>
<tr>
<th>large sample) suggests impaired psychomotor performance in people with schizophrenia compared to controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Psychomotor performance</td>
</tr>
<tr>
<td>A large effect size suggests impaired performance on digit symbol coding in people with schizophrenia compared to controls</td>
</tr>
<tr>
<td>47 studies, N = 6427 (4135 schizophrenia, 2292 controls), g = -1.50, 95%CI -1.63 to -1.35</td>
</tr>
<tr>
<td>$I^2 = 77.64, Q = 205.67, p &lt; 0.001$</td>
</tr>
<tr>
<td>Consistency</td>
</tr>
<tr>
<td>Precision</td>
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<tr>
<td>Directness</td>
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</table>

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

Comparison
Psychomotor skills in people with first-episode schizophrenia vs. healthy controls

Note: participants defined as ‘first-episode’ had either a first presentation of psychosis, initial psychiatric hospitalisation, or a minimal duration of illness/treatment

Summary of evidence
Moderate to high quality evidence (direct, large sample, inconsistent, precise) suggests a medium effect of poorer psychomotor skills in people with first-episode schizophrenia compared to controls

Psychomotor skills

Medium effect size suggests people with first-episode schizophrenia showed significantly poorer psychomotor skills compared to controls
Signs and Symptoms – Psychomotor Ability

9 studies, N = 1355, $d = -0.64$, 95%CI -0.77 to -0.52, $p < 0.001$

$Q = 53.49$, $p < 0.001$

Large effect size associated with a higher proportion of first-episode participants on antipsychotics, male controls, younger patient samples, older control samples and controls with a higher education.

Small effect size associated with a higher proportion of right handed controls, $p < 0.05$

<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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</tbody>
</table>

**Nieto R, Castellanos F**

**A Meta-Analysis of Neuropsychological Functioning in Patients with Early Onset Schizophrenia and Paediatric Bipolar Disorder**

*Journal of Clinical Child & Adolescent Psychology* 2012. 40:2, 266-280

[View review abstract online](#)

Comparison

Cognitive performance in patients with early onset schizophrenia (EOS: mean age 15.8 years) and in paediatric bipolar disorder (PBD: mean age 13.6 years) vs. controls

Summary of evidence

Moderate quality evidence (imprecise) suggests a large effect of slower processing speed, and a medium effect of poor motor skills in EOS vs. controls.

High quality evidence (precise, consistent, direct, large sample) suggests a medium to large effect of slower processing speed in PBD vs. controls

Low quality evidence (1 small study) is unable to determine any differences in motor skills between PBD and controls

**Processing speed**

*Large effect of poorer processing speed in EOS and PBD vs. controls, with EOS showing significantly larger effect than PBD*

EOS: 8 studies, N = 624, $g = -1.27$, 95%CI -1.99 to -0.55, $p < 0.005$, $Q = 0.05$, $p = 0.99$

publication bias $p = 0.54$
Signs and Symptoms – Psychomotor Ability

<table>
<thead>
<tr>
<th>PBD: 7 studies, N = 478, g = -0.79, 95%CI -1.23 to -0.35, p &lt; 0.005, Q = 2.63, p = 0.85</th>
</tr>
</thead>
<tbody>
<tr>
<td>publication bias p = 0.77</td>
</tr>
<tr>
<td>Processing speed was significantly lower in EOS vs. controls than PBD vs. controls (p &lt; 0.001)</td>
</tr>
<tr>
<td>Moderator analyses revealed significantly smaller effect sizes in studies with a lower percentage of patients taking medications in both diagnostic groups</td>
</tr>
<tr>
<td>In studies of PBD, there were smaller effect sizes in studies with higher rates of euthymia and lower rates of comorbid attention deficit hyperactivity disorder (ADHD)</td>
</tr>
<tr>
<td>In studies of EOS, there were smaller effect sizes in studies with higher percentages of right-handed participants and higher percentages of stable patients</td>
</tr>
</tbody>
</table>

Motor skills

<table>
<thead>
<tr>
<th>Medium effect in EOS and very small effect in PBD of poorer motor skills vs. controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>EOS: 4 studies, N = 242, g = -0.58, 95%CI -1.19 to 0.03, p = 0.04, Q = 0.07, p = 0.99</td>
</tr>
<tr>
<td>publication bias p = 0.35</td>
</tr>
<tr>
<td>PBD: 1 study, N = 84, g = -0.07, 95%CI -0.15 to 0.01, p = 0.04</td>
</tr>
<tr>
<td>Motor skills were significantly lower in EOS vs. controls than PBD vs. controls (p &lt; 0.01)</td>
</tr>
<tr>
<td>No significant moderators</td>
</tr>
</tbody>
</table>

Consistency: Consistent

Precision: Imprecise for EOS

Directness: Direct, apart from EOS vs. PBD

Rajji T.K., Mulsant B.H.

Nature and course of cognitive function in late-life schizophrenia: a systematic review


View review abstract online

Comparison

Psychomotor functioning in people with schizophrenia aged over 50 years (late-life schizophrenia, LLS)

Summary of evidence

Low to moderate quality evidence (large samples, direct, unable to assess consistency or precision) suggests people with late-life schizophrenia may have impaired psychomotor functioning
compared to controls. No difference was reported in psychomotor functioning between people with late-life schizophrenia and early-onset schizophrenia.

Psychomotor function

Three studies (N = 487) reported impaired motor speed and speed of information processing in ambulatory patients with late-life schizophrenia compared to controls. Two of these studies (N = 321) reported no difference in psychomotor functioning between people with early-onset schizophrenia and late-onset schizophrenia.

One study (N = 83) reported no deficits in people with late-life schizophrenia on the digit symbol substitution test compared to controls.

No data reported

Consistency
Unable to assess

Precision
Unable to assess

Directness
Direct

Rajji T.K., Ismail Z., Mulsant B.H.

Age at onset and cognition in schizophrenia: meta-analysis

View review abstract online

Comparison
Psychomotor speed of processing in people with schizophrenia with different age of onset (first-episode schizophrenia, youth-onset schizophrenia and late-onset schizophrenia) vs. controls

Note: maximum age for youth-onset was 19 years; minimum age for late-onset was 40 years; people with any other age at onset were classified as first-episode schizophrenia.

Summary of evidence
Low to moderate quality evidence (direct, unable to assess consistency or precision, large sample) suggests poorer performance in psychomotor speed of processing in people with first-episode, youth-onset and late-onset schizophrenia compared to controls. The evidence suggests that people with
**Signs and Symptoms – Psychomotor Ability**

| youth-onset schizophrenia may have impaired psychomotor speed of processing compared to people with first episode schizophrenia |

**Psychomotor speed of processing**

| N > 5010 (4057 first-episode schizophrenia, 692 youth-onset schizophrenia, 261 late-onset schizophrenia, controls not reported) |
| All three groups showed considerable psychomotor speed of processing impairment, with significant between group variability |
| First-episode schizophrenia: 62 studies, \( d = 0.65, \) SE 0.02 |
| Youth-onset schizophrenia: 17 studies, \( d = 0.92, \) SE 0.06 |
| Late-onset schizophrenia: 2 studies, \( d = 1.01, \) SE 0.21 |
| \( Q_b = 19.68, \) \( p < 0.01 \) |

**Consistency**

Unable to assess

**Precision**

Unable to assess

**Directness**

Direct

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**Schug R. and Raine A.**

*Comparative meta-analyses of neuropsychological functioning in antisocial schizophrenic persons*

Clinical Psychological Review 2009. 29: 230-242

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**Comparison**

Motor performance in people with schizophrenia and antisocial traits vs. people with schizophrenia without antisocial traits

Note: Authors state that antisocial behaviour was broadly defined as assaultive, criminal, psychopathic, or violent behaviours and included individuals who had committed specific crimes (i.e. homicide, assault) or who had specific mental disorder diagnoses (i.e. antisocial personality disorder, psychopathy)

**Summary of evidence**

High quality evidence (direct, consistent, precise) suggests no difference in motor performance in people with schizophrenia
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<table>
<thead>
<tr>
<th>and antisocial traits vs. people with schizophrenia without antisocial traits</th>
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</thead>
<tbody>
<tr>
<td><strong>Motor performance</strong></td>
</tr>
<tr>
<td><em>No significant difference in motor performance</em></td>
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<tr>
<td>7 studies, $g = 0.079$, $p &gt; 0.05$, $95%CI -0.133$ to $0.292$</td>
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<tr>
<td>$Q = 14.965$, $p &gt; 0.05$</td>
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<thead>
<tr>
<th>Comparison 2</th>
<th>Motor performance in people with schizophrenia and antisocial traits vs. people without schizophrenia with antisocial traits</th>
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<tbody>
<tr>
<td><strong>Summary of evidence</strong></td>
<td>Moderate to high quality evidence (direct, large sample, consistent, imprecise) suggests a large effect showing poorer motor performance in people with schizophrenia and antisocial traits vs. people without schizophrenia with antisocial traits</td>
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<table>
<thead>
<tr>
<th><strong>Motor performance</strong></th>
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<tbody>
<tr>
<td><em>Significant, large effect size suggests people with schizophrenia and antisocial traits have impaired motor performance compared to antisocial controls</em></td>
</tr>
<tr>
<td>3 studies, $g = -1.003$, $p &lt; 0.001$, $95%CI -1.497$ to $-0.508$</td>
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<tr>
<td>$Q = 1.664$, $p &gt; 0.05$</td>
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<td>Imprecise</td>
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<tr>
<td>Directness</td>
<td>Direct</td>
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</table>

Szőke, A., Tranfătir, A., Dunpont, M-E., Méary, A. and Schürhoff, F.

**Longitudinal studies of cognition in schizophrenia: meta-analysis**

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<table>
<thead>
<tr>
<th>Comparison</th>
<th>Cognitive testing in people with schizophrenia one two separate occasions more than 1 month apart, with no training in between tests</th>
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<tbody>
<tr>
<td>Summary of evidence</td>
<td>Moderate quality evidence (precise, direct, unable to assess consistency) suggests that people with schizophrenia may show improved performance on the digit symbol substitution task</td>
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### Psychomotor

*Significant small effect size suggests that people with schizophrenia showed improved performance on the digit symbol substitution (psychomotor performance, sustained attention) at retest compared to baseline*

<table>
<thead>
<tr>
<th>Consistency</th>
<th>Unable to assess</th>
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<tbody>
<tr>
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<td>Directness</td>
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7 studies, N = 215, $g = 0.28$, 95%CI 0.10 to 0.48, $p < 0.05$

Subgroup analysis suggests no significant difference between controls and people with schizophrenia

5 studies, N = 136, $g = 0.38$, 95%CI 0.13 to 0.63, $p < 0.05$

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*Woodward N.D, Purdon S.E, Meltzer H.Y, and Zald D.H.*

*A meta-analysis of neuropsychological change to clozapine, olanzapine, quetiapine, and risperidone in schizophrenia*

*International Journal of Neuropsychopharmacology 2005. 8: 457-472*

| Comparison | Motor skills in people with schizophrenia receiving second generation antipsychotics (clozapine, olanzapine, risperidone and quetiapine) vs. first generation antipsychotics (various) or pre- to post-treatment comparison with second generation antipsychotics |
Summary of evidence
High quality evidence (consistent, precise, direct,) suggests greater improvement in motor skills in patients receiving second generation antipsychotics compared to first generation antipsychotics
Moderate to high quality evidence (unable to assess precision) suggests patients receiving clozapine show improvement pre-to post-treatment, however patients receiving olanzapine, quetiapine or risperidone show no improvement

Motor skills

Greater improvement in motor skills was reported in patients receiving second generation antipsychotics compared to first generation antipsychotics
9 studies, N= 3226, $g = 0.21$, 95%CI 0.05 to 0.37, $p = 0.010$, Q $p > 0.05$

Post-treatment, patients receiving clozapine showed improved performance
Clozapine: 4 studies, N = 68, $g = 0.64$, $p < 0.006$, Q $p > 0.05$

Patients receiving olanzapine, risperidone or quetiapine showed no improvement post medication
Olanzapine: 5 studies, N = 238, $g = 0.25$, (CI not reported), $p > 0.05$, Q $p > 0.05$
Risperidone: 2 studies, N = 65, $g = 0.22$, (CI not reported), $p > 0.05$, Q $p > 0.05$
Quetiapine: 2 studies, N = 34, $g = 0.20$, (CI not reported), $p > 0.05$, Q $p > 0.05$

Consistency  Consistent
Precision  Precise for first vs. second generation antipsychotics, unable to assess pre-post comparison
Directness  Direct

Woodward N.D, Purdon S.E, Meltzer H.Y, Zald D.H.
A meta-analysis of cognitive changes with haloperidol in clinical trials of atypical antipsychotics: Dose effects and comparison to practice effects
Schizophrenia Research 2007. 89: 211-224
View review abstract online
Comparison of Motor skills in people with schizophrenia receiving haloperidol to assess pre-post treatment effects

Summary of evidence
High quality evidence (consistent, precise, direct) shows no improvements on motor skills tasks post treatment with haloperidol

Motor skills

No improvements on finger tapping/oscillation test or grooved pegboard test post treatment

Finger tapping/oscillation: all studies: 4 studies, N = 128, g = -0.05, 95% CI -0.30 to 0.20, p > 0.05
  Low dose: 2 studies, N = 92, g = -0.06, 95% CI -0.35 to 0.23, p > 0.05
  High dose: 2 studies, N = 36, g = -0.04, 95% CI -0.50 to 0.43, p > 0.05

Grooved pegboard test: all studies: 5 studies, N = 196, g = 0.01, 95% CI -0.17 to 0.19, p > 0.05
  Low dose: 3 studies, N = 104, g = -0.08, 95% CI -0.34 to 0.18, p > 0.05
  High dose: 2 studies, N = 92, g = 0.09, 95% CI -0.17 to 0.35, p > 0.05

Consistency
Authors report all results are consistent (using fixed effects model)

Precision
Precise

Directness
Direct

Explanation of acronyms
CI = Confidence Interval, d = Cohen’s d and g = Hedges’ g = standardised mean differences (see below for interpretation of effect size), ES = effect size, \( I^2 \) = the percentage of the variability in effect estimates that is due to heterogeneity rather than sampling error (chance), LLS = late-life schizophrenia, N = number of participants, p = statistical probability of obtaining that result (p < 0.05 generally regarded as significant), 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), RCT = randomised control trial, SE = standard error, SMD = standard
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mean difference, vs = versus
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.22

† 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.22

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 < 0.2.22 InOR stands for logarithmic OR where a InOR of 0
show 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:\ref{22}:

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

§ 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\ref{23}.

|| 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

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