

Psychomotor ability

Introduction

Psychomotor functioning refers to a wide range 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 test¹⁻⁴, and the Purdue Pegboard test⁵ that measure visuo-motor coordination. The Finger Tapping test¹⁻⁴ 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 lateralisation. 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 attention⁶. The Pursuit Rotor Motor task⁵ presents participants with a turntable with a dot in the centre that they must hold with a flexible metal wand as the turntable spins, measuring motor coordination and learning. The Star Mirror Tracing task⁵ 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. Reviews 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.

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-analysis⁸. 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)⁹. The resulting table represents an



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objective summary of the available evidence, although the conclusions are solely the opinion of staff of NeuRA (Neuroscience Research Australia).

- High quality evidence suggests a small effect of better psychomotor skills in people with a psychotic disorder and a substance use disorder than in people with a psychotic disorder without a substance use disorder.

Results

We found 18 systematic reviews that met our inclusion criteria^{1-3, 6, 7, 10-22}.

- 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 (< 16 years).
- 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 with antisocial traits without schizophrenia.
- In general, high quality evidence suggests greater improvement in motor skills in patients taking second generation antipsychotics compared to first generation antipsychotics. Specifically, moderate to high quality evidence suggests patients taking clozapine may show improvement after treatment, however patients receiving olanzapine, quetiapine, risperidone or haloperidol show no improvement.
- Moderate to low quality evidence suggests lower levels of work performance and behaviour are associated with poor psychomotor ability.



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Bora E, Yucel M, Pantelis C

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

The British Journal of Psychiatry 2009; 195: 475-482

[View review abstract online](#)

| | |
|-----------------------------------|--|
| <p>Comparison</p> | <p>Cognitive functioning in people with schizophrenia vs. people with affective psychosis or schizoaffective disorder.</p> <p>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.</p> |
| <p>Summary of evidence</p> | <p>Moderate quality evidence (direct, precise, inconsistent) suggests a small effect of lower performance on psychomotor speed tasks in people with schizophrenia compared with people with affective psychosis or schizoaffective disorder.</p> |

Psychomotor speed

A significant, small effect suggests worse psychomotor speed in people with schizophrenia compared with 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 $p =$



Psychomotor ability

SCHIZOPHRENIA LIBRARY

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| 0.01 | |
| Schizophrenia vs. schizoaffective disorder: 5 studies, $d = 0.32$, 95%CI 0.00 to 0.64, $p = 0.05$, $Q_w p = 0.15$ | |
| <i>Mental speed - worse performance in schizophrenia for all comparisons;</i> | |
| 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, $p = 0.04$, $Q_w p = 0.02$ | |
| <i>Meta-regression showed that schizophrenia samples with more severe symptoms, fewer years of education and younger age showed the greatest impairments compared with people with schizoaffective/ affective psychosis;</i> | |
| 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[‡] | Inconsistent |
| Precision in results[§] | Precise |
| Directness of results | Direct |

Bora E, Pantelis C

Meta-analysis of Cognitive Impairment in First-Episode Bipolar Disorder: Comparison With First-Episode Schizophrenia and Healthy Controls

Schizophrenia Bulletin 2015; 41(5): 1095-1104

[View review abstract online](#)

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| Comparison | Cognitive functioning in people with first-episode schizophrenia vs. people with first-episode bipolar disorder. |
| Summary of evidence | Moderate quality evidence (inconsistent) shows a small effect of poorer psychomotor speed in people with first-episode schizophrenia compared to people with first-episode bipolar |



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| | disorder. |
| Psychomotor speed | |
| <p><i>A significant, small to medium-sized effect of poorer psychomotor speed in people with first-episode schizophrenia compared with first-episode bipolar disorder;</i></p> <p>All psychomotor speed tasks: 6 studies, N = 679, $d = 0.33$, 95%CI 0.08 to 0.59, $p = 0.009$, $I^2 = 58.9%$, $p = 0.03$</p> <p>TMT A: 3 studies, N = 328, $d = 0.45$, 95%CI 0.23 to 0.68, $p < 0.001$</p> <p>TMT B: 3 studies, N = 328, $d = 0.47$, 95%CI 0.14 to 0.80, $p = 0.006$</p> <p>Digit symbol: 3 studies, N = 450, $d = 0.71$, 95%CI 0.36 to 1.06, $p < 0.001$</p> <p>Authors report no publication bias.</p> <p>No differences were found for males vs. females or younger vs. older patients.</p> | |
| Consistency in results | Inconsistent |
| Precision in results | Precise |
| Directness of results | Direct |

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| <p><i>Christensen T</i></p> <p>The influence of neurocognitive dysfunctions on work capacity in schizophrenia patients: a systematic review of the literature</p> <p>International Journal of Psychiatry in Clinical Practice 2007; 11(2): 89-101</p> <p>View review abstract online</p> | |
| Comparison | <p>Association between work capacity and psychomotor functioning/speed performance in people with schizophrenia.</p> <p>Note: work capacity is the obtain and maintain competitive work and work behaviours and skills.</p> |
| Summary of evidence | <p>Moderate to low quality evidence (direct, unable to assess consistency or precision) suggests that lower levels of work performance and behaviour are associated with poor psychomotor ability.</p> |
| Psychomotor ability | |



Psychomotor ability

2 studies (N = 208) reported that poor psychomotor functioning/speed was associated with worse work performance and behavior.

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| Consistency | Unable to assess |
| Precision | Unable to assess |
| Directness | Direct |

Cohen A, Saperstein A, Gold J, Kirkpatrick B, Carpenter W, Buchanan R

Neuropsychology of the deficit syndrome: New data and meta-analysis of findings to date

Schizophrenia Bulletin 2007; 33(5): 1201-1212

[View review abstract online](#)

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| Comparison | Psychomotor ability in people with deficit schizophrenia vs. people with non-deficit schizophrenia. |
| Summary of evidence | 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. |

Psychomotor ability

Authors report that two studies found poorer psychomotor ability in people with deficit schizophrenia when compared with controls. People with the deficit subtype generally performed worse on psychomotor tasks than did patients with non-deficit schizophrenia.

Tests included grooved pegboard, finger tapping and stroop colour. Sample sizes, effect sizes, Q and *p*-values are not reported.

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| Consistency | Unable to assess |
| Precision | Unable to assess |
| Directness | Direct |

Dickinson D, Ramsey ME, Gold JM



Psychomotor ability

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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| Comparison | Motor speed in people with schizophrenia vs. controls. |
| Summary of evidence | 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 with controls. |
| Motor speed | |
| <p><i>Large effect size suggests people with schizophrenia showed poorer motor speed performance compared with controls on tasks including;</i></p> <p>Grooved pegboard dominant: 7 studies, N = 728, $g = -0.92$, SE = 0.08, 95%CI -1.09 to -0.75, $p < 0.05$</p> <p>Grooved pegboard non-dominant: 6 studies, N = 648, $g = -0.98$, SE = 0.10, 95%CI -1.17 to -0.79, $p < 0.05$</p> <p><i>Medium effect size suggests people with schizophrenia showed poorer motor speed performance compared with controls on tasks including;</i></p> <p>Finger tapping dominant: 9 studies, N = 1073, $g = -0.68$, SE = 0.11, 95%CI -0.90 to -0.46, $p < 0.05$</p> <p>Finger tapping non-dominant: 9 studies, N = 1073, $g = -0.52$, SE = 0.09, 95%CI -0.71 to -0.34, $p < 0.05$</p> | |
| Consistency | Unable to assess |
| Precision | Precise |
| Directness | Direct |

Donoghue K, Doody GA

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



Psychomotor ability

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| <p>Neuropsychology 2012; 26 (6): 785-801 View review abstract online</p> | |
| 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 | |
| <p><i>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;</i></p> <p>Attention and psychomotor: 8 studies, N = 513, $g = 0.295$, 95%CI 0.110 to 0.479, $p = 0.002$, $I^2 = 0\%$, $p = 0.780$</p> | |
| Cognitive functioning in people with a cocaine use disorder | |
| <p><i>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;</i></p> <p>Attention and psychomotor: 5 studies, N = 236, $g = 0.326$, 95%CI 0.035 to 0.616, $p = 0.028$, $I^2 = 15\%$, $p = 0.316$</p> | |
| Cognitive functioning in people with a cannabis use disorder | |
| <p><i>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;</i></p> <p>Attention and psychomotor: 3 studies (N = 551), $g = 0.316$, 95%CI 0.144 to 0.488, $p < 0.001$, $I^2 = 0\%$, $p = 0.968$</p> | |
| Consistency in results | Consistent |
| Precision in results | Precise |
| Directness of results | Direct |



Psychomotor ability

Guilera G, Pino O, Gomez-Benito J, Rojo JE

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](#)

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| 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 with those receiving first-generation antipsychotics. |
| Psychomotor ability | |
| <i>A significantly small effect size showed greater psychomotor ability in people with schizophrenia receiving second-generation antipsychotics compared those receiving first-generation antipsychotics;</i> | |
| 5 RCT, N = 387, g = 0.29, 95%CI 0.11 to 0.47, p < 0.01 | |
| Consistency | Unable to assess |
| Precision | Precise |
| Directness | Direct |

Irani F, Kalkstein S, Moberg E, Moberg P

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

Schizophrenia Bulletin 2010; doi: 10.1093/schbul/sbq057

[View review abstract online](#)

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| Comparison | Psychomotor performance in older people with schizophrenia |
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Psychomotor ability

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| | (mean age 64 years). |
| Summary of evidence | Moderate quality evidence (direct, unable to assess consistency or precision) suggests that older people with schizophrenia may have poorer psychomotor performance than age-matched controls. |
| Psychomotor skills | |
| <p><i>Authors report a large effect of poorer psychomotor performance in older people with schizophrenia compared with the age-matched control group;</i></p> <p>Number of studies, sample sizes, effect size, Q and p-values are not reported.</p> <p>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.</p> | |
| Consistency | Unable to assess |
| Precision | Unable to assess |
| 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](#)

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| 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 with people with bipolar disorder. No difference in fine motor skills is reported from high quality evidence. |
| Psychomotor skills | |
| <i>A significant, medium effect suggests people with schizophrenia showed more impaired</i> | |



Psychomotor ability

performance on mental speed, but not fine motor skills compared with people with bipolar disorder;

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

Fine motor skills: 4 studies, (N = 339), $d = 0.06$, 95%CI -0.16 to 0.27, $p = 0.61$, $Q_w = 3.0$, $p = 0.39$

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| Consistency | Consistent for fine motor skills. |
| Precision | Precise |
| Directness | Direct |

Knowles E, David A, Reichenberg A

Processing speed deficits in schizophrenia: Reexamining the evidence

American Journal of Psychiatry 2010; 167: 828-835

[View review abstract online](#)

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| Comparison | Digit symbol coding performance in people with schizophrenia vs. controls. |
| Summary of evidence | Moderate to high quality evidence (direct, inconsistent, precise, large sample) suggests impaired psychomotor performance in people with schizophrenia compared with controls. |

Psychomotor performance

A large effect size suggests impaired performance on digit symbol coding in people with schizophrenia compared with controls;

47 studies, N = 6427, $g = -1.50$, 95%CI -1.63 to -1.35, $p < 0.05$, $I^2 = 77.64$, $p < 0.001$

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| Consistency | Inconsistent |
| Precision | Precise |
| Directness | Direct |

Mesholam-Gately R, Giuliano A, Goff K, Faraone S, Seidman L



Psychomotor ability

Neurocognition in first-episode schizophrenia: a meta analytic review

Neuropsychology 2009; 23(3): 315-335

[View review abstract online](#)

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| Comparison | <p>Psychomotor skills in people with first-episode schizophrenia vs. controls.</p> <p>Note: participants defined as ‘first-episode’ had either a first presentation of psychosis, initial psychiatric hospitalisation, or a minimal duration of illness/treatment.</p> |
| Summary of evidence | <p>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 with controls.</p> |
| Psychomotor skills | |
| <p><i>Medium effect size suggests people with first-episode schizophrenia showed significantly poorer psychomotor skills compared with controls;</i></p> <p>9 studies, N = 1355, $d = -0.64$, 95%CI -0.77 to -0.52, $p < 0.001$, $Q_w = 53.49$, $p < 0.001$</p> <p>Larger effect sizes were 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. Smaller effect sizes were associated with a higher proportion of right-handed controls.</p> | |
| Consistency | Inconsistent |
| Precision | Precise |
| Directness | Direct |

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](#)



Psychomotor ability

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| 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 | <p>Moderate quality evidence (imprecise) suggests a large effect of slower processing speed, and a medium effect of poor motor skills in EOS vs. controls.</p> <p>High quality evidence (precise, consistent, direct, large sample) suggests a medium to large effect of slower processing speed in PBD vs. controls.</p> <p>Low quality evidence (1 small study) is unable to determine any differences in motor skills between PBD and controls.</p> |
| Processing speed | |
| <p><i>Large effect of poorer processing speed in EOS and PBD vs. controls, with EOS showing significantly larger effect than PBD;</i></p> <p>EOS: 8 studies, N = 624, $g = -1.27$, 95%CI -1.99 to -0.55, $p < 0.005$, $Q = 0.05$, $p = 0.99$ PBD: 7 studies, N = 478, $g = -0.79$, 95%CI -1.23 to -0.35, $p < 0.005$, $Q = 2.63$, $p = 0.85$</p> <p>Processing speed was significantly lower in EOS vs. controls than PBD vs. controls ($p < 0.001$). Moderator analyses revealed significantly smaller effect sizes in studies with a lower percentage of patients taking medications in both diagnostic groups.</p> <p>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).</p> <p>In studies of EOS, there were smaller effect sizes in studies with higher percentages of right-handed participants and higher percentages of stable patients.</p> <p>No publication bias.</p> | |
| Motor skills | |
| <p><i>Medium effect in EOS and very small effect in PBD of poorer motor skills vs. controls;</i></p> <p>EOS: 4 studies, N = 242, $g = -0.58$, 95%CI -1.19 to 0.03, $p = 0.04$, $Q = 0.07$, $p = 0.99$ PBD: 1 study, N = 84, $g = -0.07$, 95%CI -0.15 to 0.01, $p = 0.04$</p> <p>Motor skills were significantly lower in EOS vs. controls than PBD vs. controls ($p < 0.01$). No significant moderators or publication bias.</p> | |
| Consistency | Consistent |
| Precision | Imprecise for EOS |



Psychomotor ability

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| Directness | Direct, apart from EOS vs. PBD |
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Rajji TK, Mulsant BH

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

Schizophrenia Research 2008; 102: 122-140

[View review abstract online](#)

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| Comparison | Psychomotor functioning in people with schizophrenia aged over 50 years (late-life schizophrenia). |
| Summary of evidence | Moderate to low quality evidence (large samples, direct, unable to assess consistency or precision) suggests people with late-life schizophrenia may have impaired psychomotor functioning compared with controls. No difference was reported in psychomotor functioning between people with late-life schizophrenia and early-onset schizophrenia. |
| Psychomotor function | |
| <p>Three studies (N = 487) reported impaired motor speed and speed of information processing in ambulatory patients with late-life schizophrenia compared with controls. Two of these studies (N = 321) reported no difference in psychomotor functioning between people with early-onset schizophrenia and late-onset schizophrenia.</p> <p>One study (N = 83) reported no deficits in people with late-life schizophrenia on the digit symbol substitution test compared with controls.</p> <p>No data reported.</p> | |
| Consistency | Unable to assess |
| Precision | Unable to assess |
| Directness | Direct |

Rajji TK, Ismail Z, Mulsant BH



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Age at onset and cognition in schizophrenia: meta-analysis

The British Journal of Psychiatry 2009; 195: 286-293

[View review abstract online](#)

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| <p>Comparison</p> | <p>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.</p> <p>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.</p> |
| <p>Summary of evidence</p> | <p>Moderate to low 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 with controls. The evidence suggests that people with youth-onset schizophrenia may have impaired psychomotor speed of processing compared with people with first episode schizophrenia.</p> |
| <p style="text-align: center;">Psychomotor speed of processing</p> | |
| <p>N > 5010 (4057 first-episode schizophrenia, 692 youth-onset schizophrenia, 261 late-onset schizophrenia, controls not reported).</p> <p><i>All three groups showed considerable psychomotor speed of processing impairment, with significant between group variability;</i></p> <p style="padding-left: 40px;">First-episode schizophrenia: 62 studies, $d = 0.65$, SE 0.02</p> <p style="padding-left: 40px;">Youth-onset schizophrenia: 17 studies, $d = 0.92$, SE 0.06</p> <p style="padding-left: 40px;">Late-onset schizophrenia: 2 studies, $d = 1.01$, SE 0.21</p> <p style="padding-left: 80px;">$Q_B = 19.68, p < 0.01$</p> | |
| <p>Consistency</p> | <p>Unable to assess</p> |
| <p>Precision</p> | <p>Unable to assess</p> |
| <p>Directness</p> | <p>Direct</p> |

Schug R, Raine A



Psychomotor ability

Comparative meta-analyses of neuropsychological functioning in antisocial schizophrenic persons

Clinical Psychological Review 2009; 29: 230-242

[View review abstract online](#)

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| Comparison | <p>Motor performance in people with schizophrenia and antisocial traits vs. people with schizophrenia without antisocial traits.</p> <p>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).</p> |
| Summary of evidence | <p>High quality evidence (direct, consistent, precise) suggests no difference in motor performance in people with schizophrenia and antisocial traits vs. people with schizophrenia without antisocial traits.</p> |
| Motor performance | |
| <p><i>No significant difference in motor performance;</i></p> <p>7 studies, $g = 0.079$, $p > 0.05$, 95%CI -0.133 to 0.292, $Q_w = 14.965$, $p > 0.05$</p> | |
| Consistency | Consistent |
| Precision | Precise |
| Directness | Direct |
| Comparison 2 | <p>Motor performance in people with schizophrenia and antisocial traits vs. people without schizophrenia with antisocial traits.</p> |
| Summary of evidence | <p>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.</p> |
| Motor performance | |



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Significant, large effect size suggests people with schizophrenia and antisocial traits have impaired motor performance compared with antisocial controls;

3 studies, $g = -1.003$, $p < 0.001$, 95%CI -1.497 to -0.508, $Q_w = 1.664$, $p > 0.05$

| | |
|--------------------|------------|
| Consistency | Consistent |
| Precision | Imprecise |
| Directness | Direct |

Szöke A, Tranfafir A, Dunpont ME, Méary A, Schürhoff F

Longitudinal studies of cognition in schizophrenia: meta-analysis

The British Journal of Psychiatry 2008; 192: 248-257

[View review abstract online](#)

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|----------------------------|---|
| Comparison | Cognitive testing in people with schizophrenia one two separate occasions more than 1 month apart, with no training in between tests. |
| Summary of evidence | Moderate quality evidence (precise, direct, unable to assess consistency) suggests that people with schizophrenia may show improved performance on the digit symbol substitution task. |

Psychomotor

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

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, $p < 0.05$

| | |
|--------------------|------------------|
| Consistency | Unable to assess |
| Precision | Precise |
| Directness | Direct |



Psychomotor ability

Woodward ND, Purdon SE, Meltzer HY, Zald DH

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

International Journal of Neuropsychopharmacology 2005; 8: 457-472

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| | |
|--|---|
| 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 | <p>High quality evidence (consistent, precise, direct,) suggests greater improvement in motor skills in patients receiving second generation antipsychotics compared with first generation antipsychotics.</p> <p>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.</p> |
| Motor skills | |
| <p><i>Greater improvement in motor skills was reported in patients receiving second generation antipsychotics compared with patients receiving first generation antipsychotics;</i></p> <p>9 studies, N= 3226, $g = 0.21$, 95%CI 0.05 to 0.37, $p = 0.010$, Q-test $p > 0.05$</p> <p><i>Post-treatment, patients receiving clozapine showed improved performance;</i></p> <p>Clozapine: 4 studies, N = 68, $g = 0.64$, $p < 0.006$, Q-test $p > 0.05$</p> <p><i>Patients receiving olanzapine, risperidone or quetiapine showed no improvement post medication;</i></p> <p>Olanzapine: 5 studies, N = 238, $g = 0.25$, (CI not reported), $p > 0.05$, Q-test $p > 0.05$</p> <p>Risperidone: 2 studies, N = 65, $g = 0.22$, (CI not reported), $p > 0.05$, Q-test $p > 0.05$</p> <p>Quetiapine: 2 studies, N = 34, $g = 0.20$, (CI not reported), $p > 0.05$, Q-test $p > 0.05$</p> | |
| Consistency | Consistent |
| Precision | Precise for first vs. second generation antipsychotics, unable to |



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| | |
|-------------------|-----------------------------|
| | assess pre-post comparison. |
| Directness | Direct |

Woodward ND, Purdon SE, Meltzer HY, Zald DH

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 | 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 | |
| <p><i>No improvements on finger tapping/ oscillation test or grooved pegboard test post treatment;</i></p> <p>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, $p > 0.05$</p> <p>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, $p > 0.05$</p> | |
| Consistency | Authors report all results are consistent (using fixed effects model). |
| Precision | Precise |
| Directness | Direct |



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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), 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_B = test for between group differences (heterogeneity between groups of studies for an outcome of interest), Q_w = test for within group differences (heterogeneity in study results within a group of studies – measure of study consistency), RCT = randomised control trial, SE = standard error, SMD = standard mean difference, vs = versus

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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 small²³.

† 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 effect²³.

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 ²⁴. InOR stands for logarithmic OR where a InOR of 0 shows no difference between groups. Hazard ratios

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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) 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;²³

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

§ 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.²⁵

|| 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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