



## Movement disorders

### Introduction

Movement disorders have been reported in people with schizophrenia, with tardive dyskinesia among the most commonly reported. This disorder is a 'hyper-kinetic' (excessive movement) disorder, characterised by jerky, involuntary movements, usually of the face and/or limbs. Parkinsonism is another movement disorder associated with schizophrenia and is a 'hypo-kinetic' (reduced movement) disorder, characterised by slowness of movement and rigidity. Movement disorders are primarily associated with the use of antipsychotic medications, however they have also been reported in people who are antipsychotic-naïve<sup>1-3</sup>.

### 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. 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. Reviews with pooled data are prioritised for inclusion.

Review reporting assessment was guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses ([PRISMA](#)) checklist that describes a preferred way to present a meta-analysis<sup>4</sup>. 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 less than 50% of items checked have now 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, there is a dose dependent response or if results are reasonably consistent, precise and direct with low associated risks (see end of table for an explanation of these terms)<sup>5</sup>. The resulting table represents an objective summary of the available evidence, although the conclusions are solely the opinion of staff of NeuRA (Neuroscience Research Australia).

### Results

We found three systematic reviews that met our inclusion criteria<sup>1-3</sup>.



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### Conclusions

- Moderate to high quality evidence suggests a large increase in the risk of dyskinesia and parkinsonism in people with schizophrenia compared to controls, and a small increase in this risk in first-degree relatives compared to controls.
- Moderate to high quality evidence suggests non-white ethnicity and the presence of early extrapyramidal symptoms is associated with a small to medium-sized increase in the risk of tardive dyskinesia. There was no effect of age, sex, or medication dose.
- Moderate quality evidence suggests spontaneous movement disorder may occur in antipsychotic-naïve patients, with approximately 17% showing symptoms of parkinsonism, and 9% showing symptoms of dyskinesia.



Koning JPF, Tenback DE, Van Os J, Aleman A, Kahn RS, van Harten PN

**Dyskinesia and parkinsonism in antipsychotic-naïve patients with schizophrenia, first-degree relatives and healthy controls: a meta-analysis**

Schizophrenia Bulletin 2010; 36(4): 723-31

[View review abstract online](#)

<b>Comparison</b>	<b>Rates of movement disorder (dyskinesia and parkinsonism) in antipsychotic naïve patients with schizophrenia and first-degree relatives vs. controls.</b>
<b>Summary of evidence</b>	<b>Moderate to high quality evidence (large samples, imprecise, consistent, direct) suggests a large increase in risk of dyskinesia and parkinsonism compared to controls, and a small increase in risk in first-degree relatives compared to controls.</b>
<b>Dyskinesia</b>	
<p><i>A large, significant effect size suggests people with schizophrenia are at increased risk of dyskinesia compared to controls;</i></p> <p>5 studies, N = 407, OR = 3.59, 95%CI 1.53 to 8.41, <math>p &lt; 0.01</math>, <math>Q = 1.79</math>, <math>p = 0.77</math></p> <p><i>A small, significant effect size suggests first-degree relatives of people with schizophrenia are also at increased risk of dyskinesia compared to controls;</i></p> <p>6 studies, N = 774, OR = 1.38, 95%CI 1.06 to 1.81, <math>p = 0.02</math>, <math>Q = 0.73</math>, <math>p = 0.98</math></p> <p>Meta-regressions reported a significant relationship between increasing rates of dyskinesia and increasing age in both schizophrenia patients (<math>\beta = 0.07</math>, <math>p = 0.02</math>) and controls (<math>\beta = 0.06</math>, <math>p &lt; 0.01</math>) and longer duration of untreated schizophrenia (<math>\beta = 0.28</math>, <math>p &lt; 0.01</math>), with no relationship to age of onset (<math>\beta = 0.15</math>, <math>p = 0.07</math>).</p>	
<b>Parkinsonism</b>	
<p><i>A large effect size suggests people with schizophrenia are at significantly increased risk of parkinsonism compared to controls;</i></p> <p>3 studies, N = 234, OR = 5.32, 95%CI 1.75 to 16.23, <math>p &lt; 0.01</math>, <math>Q = 0.40</math>, <math>p = 0.82</math></p> <p><i>A small, significant effect size suggests first-degree relatives of people with schizophrenia are also at increased risk of parkinsonism compared to controls;</i></p> <p>6 studies, N = 774, OR = 1.37, 95%CI 1.05 to 1.79, <math>p = 0.03</math>, <math>Q = 2.30</math>, <math>p = 0.81</math></p> <p>Meta-regressions reported no association between prevalence of parkinsonism and patient age (<math>\beta = 0.01</math>, <math>p = 0.44</math>) or control age (<math>\beta = 0.03</math>, <math>p = 0.27</math>); duration of untreated schizophrenia (<math>\beta = 0.04</math>, <math>p =</math></p>	



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0.43) or age of onset ( $\beta = 0.01, p = 0.82$ ).

<b>Consistency in results</b>	Consistent
<b>Precision in results</b>	Imprecise
<b>Directness of results</b>	Direct

*Pappa S, Dazzan P*

**Spontaneous movement disorders in antipsychotic-naïve patients with first-episode psychosis: a systematic review**

Psychological Medicine 2009; 39: 1065-1076

[View review abstract online](#)

<b>Comparison</b>	<b>Rates of movement disorder (dyskinesia, parkinsonism, akathisia) in antipsychotic naïve patients with schizophrenia vs. controls.</b>
<b>Summary of evidence</b>	<b>Moderate quality evidence (large samples, unable to assess consistency or precision, direct) suggests spontaneous movement disorder may occur in antipsychotic-naïve patients, with approximately 17% showing symptoms of parkinsonism and 9% showing symptoms of dyskinesia.</b>
<b>Parkinsonism</b>	
11 studies (N = 692) reported the prevalence of parkinsonism in patients with first-episode schizophrenia ranged from 2.3% to 27%, median prevalence 17%.	
<b>Dyskinesia</b>	
10 studies (N = 496) reported the prevalence of parkinsonism in patients with first-episode schizophrenia ranged from 0% to 14%, median prevalence 9%.	
<b>Akathisia</b>	



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6 studies (N = 336) reported the prevalence of parkinsonism in patients with first-episode schizophrenia ranged from 0% to 8%.	
<b>Consistency in results</b>	No measure of consistency is reported.
<b>Precision in results</b>	No measure of precision is reported.
<b>Directness of results</b>	Direct

Tenback DE, van Harten PN, van Os J

**Non-therapeutic risk factors for onset of tardive dyskinesia in schizophrenia: a meta-analysis**

**Movement Disorders 2009; 24(16): 2309-15**

[View review abstract online](#)

<b>Comparison</b>	<b>Risk factors associated with tardive dyskinesia (TD) in people with schizophrenia.</b>
<b>Summary of evidence</b>	<b>Moderate to high quality evidence (large samples, consistent, imprecise, direct) suggests non-white ethnicity and the presence of early extrapyramidal symptoms is associated with a small to medium size increase in the risk of tardive dyskinesia. There was no effect of age, sex, or medication dose.</b>

**Risk factors**

*The following risk factors confer a small to medium size increase in the risk of developing TD in patients with schizophrenia;*

*Non-white ethnicity:* 3 studies, N = 837, RR = 1.82, 95%CI 1.07 to 3.12,  $p = 0.03$ ,  $Q = 1.03$ ,  $p = 0.6$

*Early extrapyramidal symptoms:* 5 studies, N = 8,377, RR = 1.62, 95%CI 1.16 to 2.27,  $p = 0.005$ ,  $Q = 5.49$ ,  $p = 0.24$

There was no significant effect of:

*Age:* 4 studies, N = 369, RR = 1.03, 95%CI 1.00 to 1.06,  $p = 0.10$ ,  $Q = 5.26$ ,  $p = 0.15$

*Female sex:* 5 studies, N = 1,178, RR = 1.01, 95%CI 0.78 to 1.31,  $p = 0.96$ ,  $Q = 3.28$ ,  $p = 0.66$

*Medication dose:* 4 studies, N = 341, RR = 1.01, 95%CI 0.99 to 1.04,  $p = 0.43$ ,  $Q = 6.23$ ,  $p = 0.10$

*Akathisia:* 3 studies, N = 165, RR = 1.61, 95%CI 0.61 to 4.24,  $p = 0.33$ ,  $Q = 1.32$ ,  $p = 0.25$



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<b>Consistency in results</b>	Consistent
<b>Precision in results</b>	Imprecise for all except age, medication
<b>Directness of results</b>	Direct

### Explanation of acronyms

CI = confidence interval,  $\beta$  = regression coefficient, N = number of participants, OR = odds ratio,  $p$  = statistical probability of obtaining that result ( $p < 0.05$  generally regarded as significant), Q = test for heterogeneity, TD = tardive dyskinesia, 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 small<sup>6</sup>.

† 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.

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. 0.2 represents a small effect, 0.5 a medium effect, and 0.8 and over represents a large treatment effect<sup>6</sup>.

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).

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, an 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. An 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  $< 0.2$ <sup>7</sup>. 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 are an 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 substantial heterogeneity and 75% to 100%: considerable heterogeneity.  $I^2$  can be calculated from  $Q$  (chi-square) for the test of heterogeneity with the following formula;

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

§ 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<sup>8</sup>.

|| 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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