

Physical activity

Introduction

Increased physical activity has the potential to improve physical and mental health for people with schizophrenia. Individuals with serious mental illnesses are more likely to be sedentary than the general population and are consequently at high risk for chronic medical conditions associated with inactivity. Positive psychological effects from physical activity in clinical populations have been reported, including improved quality of life.

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 given priority 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-analysis¹. 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 (RCT) may be downgraded to moderate or low if review and study quality is limited, if there is inconsistency in results, indirect comparisons, imprecise or sparse data and high probability of reporting bias. It may also be downgraded if risks associated with the intervention or other matter under review are high. Conversely, low quality evidence such as that gained from observational studies may be upgraded if effect sizes are large or if there is a dose dependent response. We have also taken into account sample size and whether results are consistent, precise and direct with low associated risks (see end of table for an explanation of these terms).² The resulting table represents an objective summary of the available evidence, although the conclusions are solely the opinion of staff of NeuRA (Neuroscience Research Australia).

Results

We found six systematic reviews that met our inclusion criteria³⁻⁸.

- Moderate to high quality evidence suggests people with a psychotic disorder, and those with at-risk mental states, were less active, more sedentary, and had reduced cardiorespiratory fitness than people without a mental illness. People with schizophrenia were less active, but also less sedentary than people with bipolar disorder.
- Moderate to low quality evidence suggests decreased physical activity was associated with lower education, lower SES, longer illness duration, more hospitalisations, cardio-metabolic comorbidity, increased



Physical activity

antipsychotic side-effects, and negative symptoms.

- Increased physical activity was associated with being a non-smoker, healthy eating and drinking habits, better physical fitness, knowledge on cardiovascular disease risk factors, greater belief in the physical activity benefits, intention to engage in physical activity, increased self-efficacy, better physical self-perception, and an improved health-related quality of life.

Physical activity

Fusar-Poli P, Tantardini M, De Simone S, Ramella-Cravaro V, Oliver D, Kingdon J, Kotlicka-Antczak M, Valmaggia L, Lee J, Millan MJ, Galderisi S, Balottin U, Ricca V, McGuire P

Deconstructing vulnerability for psychosis: Meta-analysis of environmental risk factors for psychosis in subjects at ultra high-risk

European Psychiatry 2017; 40: 65-75

[View review abstract online](#)

Comparison	Physical activity in people with ultra high-risk (UHR) mental states determined as; attenuated psychotic symptoms, brief and limited intermittent psychotic symptoms, and genetic risk and functional deterioration.
Summary of evidence	Moderate quality evidence (small sample, consistent, imprecise, direct) suggests a medium-sized effect of reduced physical activity in people with ultra high-risk mental states.
Physical activity	
<p><i>A significant, medium-sized effect of decreased physical activity;</i> 2 studies, N = 136, OR = 3.547, 95%CI 1.694 to 7.425, $p = 0.001$, $I^2 = 0\%$, $p = 0.327$ There was no evidence of publication bias.</p>	
Consistency in results	Consistent
Precision in results	Imprecise
Directness of results	Direct

Heggelund J, Vancampfort D, Tacchi MJ, Morken G, Scott J

Is there an association between cardiorespiratory fitness and stage of illness in psychotic disorders? A systematic review and meta-analysis

Acta Psychiatrica Scandinavica 2019; 141: 190-205

[View review abstract online](#)

Comparison	Cardiorespiratory fitness in people at risk of, or with a psychotic disorder vs. controls.
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Physical activity

Summary of evidence	Moderate to high quality evidence (large sample, inconsistent, precise, direct) suggests a large effect of reduced cardiorespiratory fitness in those at risk of or with a psychotic disorder.
Cardiorespiratory fitness	
<p><i>A large effect showed reduced cardiorespiratory fitness in those at risk or with a psychotic disorder; 10 studies, N = 6,243, g = -0.93, 95%CI -1.14 to -0.71, p < 0.05, I² = 69%, p = 0.001</i></p> <p>Effect sizes remained large in subgroup analyses of people at clinical high risk, first-episode psychosis, and chronic samples compared to controls.</p> <p>Meta-regression suggested older age and more males in a sample were significantly associated with a larger effect size. There was a trend effect for increased BMI and larger effect size. There were no moderating effects of clinical diagnosis or method of assessing oxygen consumption.</p>	
Consistency in results	Inconsistent
Precision in results	Precise
Directness of results	Direct

Ohi K, Kataoka Y, Shimada T, Kuwata A, Okubo H, Kimura K, Yasuyama T, Uehara T, Kawasaki Y

Meta-analysis of physical activity and effects of social function and quality of life on the physical activity in patients with schizophrenia

European Archives of Psychiatry and Clinical Neuroscience 2019; 269: 517-27

[View review abstract online](#)

Comparison	Physical activity in people with schizophrenia vs. controls.
Summary of evidence	Moderate quality evidence (medium-sized sample, inconsistent, precise, direct) suggests a medium-sized effect of reduced physical activity in people with schizophrenia, particularly vigorous physical activity. Decreased physical activity was related to poor social functioning and quality of life.
Cardiorespiratory fitness	
<p><i>A medium-sized effect showed lower total physical activity in people with schizophrenia;</i></p>	

Physical activity

3 studies, N = 344, $g = -0.53$, 95%CI -0.95 to -0.12, $p < 0.05$, $I^2 = 67\%$

Subgroup analysis showed only vigorous activity was significantly lower in patients, with no differences in moderate or light activity.

Decreased vigorous physical activity was related to impaired social functioning, recreation, independence, employment, and quality of life (all small associations).

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

Stubbs B, Williams J, Gaughran F, Craig T

How sedentary are people with psychosis? A systematic review and meta-analysis

Schizophrenia Research 2016; 171: 103-109

[View review abstract online](#)

Comparison	Sedentary behaviour in people with schizophrenia.
Summary of evidence	Moderate quality evidence (medium-sized sample, inconsistent, imprecise, direct) suggests a large effect of more sedentary behaviour in people with schizophrenia than people without schizophrenia.
Sedentary behaviour	
<p><i>A large, significant effect of more sedentary behaviour in people with psychosis vs. controls;</i> 4 studies, N = 375, $g = 1.13$, 95%CI 0.496 to 1.77, $p < 0.001$, $I^2 = 80\%$ This equated to a mean difference of 2.80 (95%CI 1.47 to 4.1) hours per day. 13 studies N = 2,033 People with any psychosis spent 11.0 hours (95%CI 8.72 to 13.3) per day being sedentary. People with schizophrenia spent 11.2 hours (95%CI 8.80 to 13.6) per day being sedentary. Objective measures recorded significantly higher levels of sedentary behavior than self-report.</p>	
Consistency in results	Inconsistent
Precision in results	Imprecise

Physical activity

Directness of results	Direct
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Vancampfort D, Knapen J, Probst M, Scheewe T, Remans S, De Hert M

A systematic review of correlates of physical activity in patients with schizophrenia

Acta Psychiatrica Scandinavica 2012; 125: 352-362

[View review abstract online](#)

Comparison	Factors associated with increased or decreased physical activity in people with schizophrenia.
Summary of evidence	Moderate to low quality evidence (unclear sample size, unable to assess consistency or precision, direct) suggests predictors of low levels of activity included lower education, lower SES, longer illness duration, more hospitalisations, cardio-metabolic comorbidity, increased antipsychotic side-effects, and negative symptoms. Higher levels of activity were predicted by several factors, including non-smokers, healthy eating and drinking habits, better physical fitness, knowledge of cardiovascular disease risk factors, belief in the benefits of physical activity, increased self-efficacy, better physical self-perception, and improved health-related quality of life.

Correlates of physical activity

25 studies reported correlates of physical activity in patients with schizophrenia

Demographic factors;

Less-educated patients with a lower socio-economic status and those patients with a longer illness duration and more hospitalisations during the last 3 years demonstrate lower physical activity participation.

No consistent associations were reported for age and gender, employment, marital status, duration of the last hospitalisation and ethnicity.

Biological factors;

Cardio-metabolic comorbidity and increased side-effects of antipsychotic medication were associated with less physical activity.

Patients with a better physical fitness and functional exercise capacity were more involved in physical activity.

Physical activity

Weight gain in the previous months and antipsychotic use, type and dose were unrelated to physical activity level.

Psychological, cognitive and emotional factors;

The presence of negative symptoms was associated with less physical activity.

Knowledge on cardiovascular disease risk factors, a greater belief in the physical activity benefits, intention to engage in physical activity, increased self-efficacy and better physical self-perception and an improved health-related quality of life were all associated with increased physical activity.

Behavioural attributes/skills;

Being a non-smoker with healthy eating and drinking habits was associated with increased physical activity.

Social/cultural factors;

Patients who perceived having no social support reported lower physical activity levels.

Physical environment;

Healthcare setting in which patients were treated was unrelated with the level of physical activity.

Consistency in results	Unable to assess; no measure of consistency is reported.
Precision in results	Unable to assess; no measure of precision is reported.
Directness of results	Direct

Vancampfort D, Firth J, Schuch FB, Rosenbaum S, Mugisha J, Hallgren M, Probst M, Ward PB, Gaughran F, De Hert M, Carvalho AF, Stubbs, B.

Sedentary behavior and physical activity levels in people with schizophrenia, bipolar disorder and major depressive disorder: a global systematic review and meta-analysis

World Psychiatry 2017; 16: 308-15

[View review abstract online](#)

Comparison	Sedentary behaviour and physical activity in people with a severe mental illness vs. people without a mental illness. The sample also included people with bipolar disorder or major depression.
Summary of evidence	Moderate to high quality evidence (large sample, some inconsistencies, precise, direct) suggests a small effect of people with a severe mental illness being less active and more sedentary than people without a mental illness. People with

Physical activity

	<p>bipolar disorder were both more active and more sedentary than people with schizophrenia or major depression.</p> <p>Lower physical activity levels were associated with patients in North America vs. Europe or Oceania, outpatients vs. inpatients, use of antidepressants, males, being single, being unemployed, smoking, a higher body mass index and a lower cardio-respiratory fitness.</p>
Physical activity	
<p><i>A small effect of people with a severe mental illness being less active than controls;</i> Moderate activity: 69 studies, N = 38,615, SMD = 0.35, 95%CI 0.10 to 0.60, $p = 0.002$, $I^2 = 77%$ Mean difference = 10 minutes per day.</p> <p>Vigorous activity: 69 studies, N = 38,615, SMD = 0.20, 95%CI 0.10 to 0.30, $p < 0.001$, $I^2 = 53%$ Mean difference = 3 minutes per day.</p> <p>People with schizophrenia or major depression were less active than people with bipolar disorder.</p> <p>People in Europe were more active than those in North America, or Oceania.</p> <p>Inpatients were more physically active than outpatients or while community patients.</p> <p>Lower levels of vigorous physical activity were reported with objective vs. subjective measures.</p> <p>Lower moderate or vigorous physical activity levels were associated with a higher percentage of people taking antidepressants, a lower percentage of male and single participants, a higher percentage of unemployment, a lower percentage of smokers, a higher body mass index and a lower cardio-respiratory fitness.</p>	
Sedentary behaviour	
<p><i>A small effect of people with a severe mental illness being more sedentary than controls;</i> 69 studies, N = 38,615, SMD = 0.10, 95%CI 0.00 to 0.20, $p = 0.003$, $I^2 = 37%$ Mean difference = 10 minutes per day.</p> <p>People with schizophrenia or major depression were less sedentary than people with bipolar disorder.</p> <p>People in Europe were less sedentary than those in North or South America, or Asia.</p> <p>Greater amounts of sedentary behaviour were found when assessed using objective rather than self-reported measures.</p>	
Consistency in results	Inconsistent for physical activity, consistent for sedentary behaviour.
Precision in results	Precise
Directness of results	Direct

Physical activity

Explanation of acronyms

CI = confidence interval, g = Hedges g , standardised mean difference, I^2 = measure of heterogeneity across study results, N = number of participants, SES = social-economic status, SMD = standardised mean difference, vs. = versus

Physical activity

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 small⁹.

† 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 effect⁹.

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

Physical activity

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 formula⁹;

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

§ 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 relaxed¹¹.

|| 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.

Physical activity

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