Electrophysiology - P300

Introduction
The P300 wave is an event-related brain potential (ERP) measured using electroencephalography (EEG). P300 refers to a spike in activity approximately 300ms following presentation of the target stimulus, which is alternated with standard stimuli to create an ‘oddball’ paradigm, which is most commonly auditory. In this paradigm, the subject must respond only to the infrequent target stimulus rather than the frequent standard stimulus [1-5]. The amplitude of the P300 response is proportional to the amount of attentional resource devoted to the task and the degree of information processing required, while the latency is considered a measure of stimulus classification speed, unrelated to behavioural response time [1, 5].

P300 has been proposed as a biological marker for schizophrenia, as both amplitude and latency abnormalities have been reported [1-5]. Classification of P300 as a schizophrenia endophenotype is under debate.

Method
We have included only systematic reviews (systematic literature search, detailed methodology with inclusion/exclusion criteria) published in full text, in English, from the year 2000 that report results separately for people with a diagnosis of schizophrenia, schizoaffective disorder, schizophreniform disorder or first episode schizophrenia. As part of a wider search for all topics included in the library, reviews on P300 ERPs in schizophrenia were identified by searching the databases MEDLINE, EMBASE, CINAHL, Current Contents, PsycINFO and the Cochrane library. Hand searching reference lists of identified reviews was also conducted. When multiple copies of reviews were found, only the most recent version was included. The decision to include or exclude reviews was conducted in duplicate by two independent reviewers with any disagreements settled by discussion. All quality assessments and data extraction have been completed in duplicate by two reviewers who were not masked to review authors.

Review reporting assessment was guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist (formerly the QUOROM statement) which describes a preferred way to present a meta-analysis [6]. Reviews were assigned a low, medium or high possibility of reporting bias depending on how many items were checked. For instance, a low possibility of bias would be assigned to reviews checking over 66% of items, a medium possibility between 33 and 66% and a high possibility would be given to reviews checking less than 33%. Reviews rated as having a high possibility of reporting bias have been excluded from the library. The PRISMA flow diagram is a suggested way of providing information about studies included and excluded with reasons for exclusion. Where no flow diagram has been presented by individual reviews, but identified studies have been described in the text, reviews have been checked for this item. Note that early reviews may have been guided by less stringent reporting checklists than the PRISMA, and that some reviews may have been limited by journal guidelines.

Evidence was graded using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) Working Group approach where high quality evidence such as that gained from randomized 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, 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)[7]. 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 P300 ERPs. We found five systematic reviews that met our inclusion criteria [1-5]. No reviews were excluded.

See PRISMA checklist for review quality assessments.

Conclusions

• Moderate quality evidence suggests P300 amplitude is reduced and that P300 latency is increased in schizophrenia, particularly in medication-free patients. This has also been observed in non-psychotic relatives of schizophrenia patients, though of a lesser magnitude

• Moderate quality evidence suggests the highest magnitude of difference was reported in electrodes corresponding to the parietal cortex, and was lateralised to the left hemisphere, with highest magnitude around the left temporal lobe.
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*Bramon E., Rabe-Hesketh S., Sham P., Murray RM., Frangou S.*

**Meta-analysis of the P300 and P50 waveforms in schizophrenia**


*View review abstract online*

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<th>Comparison 1</th>
<th>Comparison of P300 ERP amplitude and latency in schizophrenia vs. healthy controls</th>
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<tr>
<td>Summary of evidence</td>
<td>Moderate quality evidence (very large sample sizes, precise, direct, inconsistent) suggests P300 amplitude is reduced and latency is increased in schizophrenia, and this is particularly noted in medication-free patients</td>
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</table>

**P300 activity**

†*Meta-analysis compared schizophrenia and control for P300 amplitude and latency, measured at the mean response of PZ and CZ electrodes*

- 46 studies, N = 2694

**P300 amplitude**

Moderate effect size suggests significantly reduced amplitude in schizophrenia

\[ d = 0.785, 95\% \text{CI } 0.65 \text{ to } 1.05, p < 0.001 \]

**P300 latency**

Moderate effect size suggests significantly increased latency in schizophrenia

\[ d = -0.57, 95\% \text{CI } -0.75 \text{ to } -0.38, p < 0.001 \]

**Subgroup analysis: Effect of antipsychotics**

- 11 studies on medication-free patients, N = 516

**P300 amplitude**

Large effect size suggests significantly reduced amplitude in medication-free schizophrenia

\[ d = 1.23, 95\% \text{CI } 0.86 \text{ to } 1.60, p < 0.001 \]

**P300 latency**

Small effect size suggests significantly increased latency in medication-free schizophrenia

\[ d = -0.48, 95\% \text{CI } -0.80 \text{ to } -0.15, p = 0.004 \]

Meta-regression identified that amplitude was significantly more abnormal in medication-free than medicated patients, \( p = 0.03 \), Random effects model
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<td>Directness of results</td>
<td>Direct comparison of P300 activity in schizophrenia and control</td>
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### Bramon E., McDonald C., Croft R.J., Landau S., Filbey F., Gruzelier J.H., Sham P.C., Frangou S., Murray R.M.

**Is the P300 wave an endophenotype for schizophrenia? A meta-analysis and a family study**

*Neurolmage 2005; 27:960-968*  
[View online review abstract](#)

### Comparison 1

**Comparison of P300 ERP amplitude and latency in non-psychotic relatives of schizophrenia patients vs. healthy controls**

### Summary of evidence

Moderate quality evidence (large sample size, precise, direct, inconsistent) suggests P300 amplitude is significantly reduced and latency is significantly increased in non-psychotic relatives of schizophrenia patients

### P300 amplitude

Meta-analysis considered non-psychotic relatives of schizophrenia patients and healthy controls for P300 amplitude and latency, measured at the mean response of PZ and CZ electrodes

- 11 studies, N = 985
- Moderate effect size suggests reduced P300 amplitude in relatives
  - **Amplitude:** \( d = 0.61, 95\% \text{CI} 0.30 \text{ to } 0.91, p < 0.001 \)
- Moderate effect size suggests increased (delayed) latency in relatives
  - **Latency:** \( d = -0.50, 95\% \text{CI} -0.88 \text{ to } -0.13, p = 0.009 \)
  - Random effects model

### Consistency in results

Significant between-study heterogeneity reported for amplitude, \( p < 0.001 \), for latency, \( p = 0.02 \)

### Precision in results

Precise for all outcomes

### Directness of results

Direct comparison of P300 amplitude and latency in non-psychotic relatives and controls
Comparison 2

Comparison of P300 ERP amplitude and latency in schizophrenia patients vs. non-psychotic relatives of schizophrenia patients

Summary of evidence

Moderate quality evidence (large sample size, precise, direct, inconsistent) suggests P300 amplitude is significantly reduced and latency is significantly increased in schizophrenia patients compared to their non-psychotic relatives

**P300 amplitude**

*Meta-analysis considered schizophrenia patients and their non-psychotic relatives for P300 amplitude and latency, measured at the mean response of PZ and CZ electrodes*

9 studies, N = 579

Small effect size suggests greater reduction in P300 amplitude in patients than relatives

**Amplitude:** $d = 0.39$, 95%CI 0.05 to 0.73, $p = 0.03$

Small effect size suggests greater increase (delay) in latency in patients than relatives

**Latency:** $d = -0.28$, 95%CI -0.45 to -0.12, $p < 0.01$

Random effects model

**Consistency in results**

Significant between-study heterogeneity reported for amplitude, $p = 0.02$, for latency, $p < 0.01$

**Precision in results**

Precise for all outcomes

**Directness of results**

Direct comparison of P300 amplitude and latency in non-psychotic relatives and controls

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**Galderisi S., Mucci A., Volpe U., Boutros N.**

Evidence-based medicine and electrophysiology in schizophrenia


[View review abstract online](#)

Comparison 1

Comparison of P300 amplitude, measured by qualitative spectral EEG in schizophrenia vs. healthy controls

Note – this review also in EEG table
**Technical Commentary**

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<table>
<thead>
<tr>
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<th>Moderate quality evidence (large sample size, precise, direct, inconsistent) suggests P300 amplitude is reduced in schizophrenia</th>
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</table>

**P300 amplitude**

*Meta-analysis considered schizophrenia patients and controls for P300 amplitude, measured at the PZ electrode*

- Reduced P300 amplitude
  - 52 studies, 60 independent samples, N = 3073
  - Large effect size suggesting reduced P300 amplitude in schizophrenia
    - $d = -0.93$, 95%CI -1.034 to -0.821
    - SE = 0.054, variance = 0.003

<table>
<thead>
<tr>
<th>Consistency in results</th>
<th>Significant heterogeneity reported in spectral wave samples</th>
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<tbody>
<tr>
<td>Precision in results</td>
<td>Precise</td>
</tr>
<tr>
<td>Directness of results</td>
<td>Direct comparison of EEG activity in schizophrenia and control</td>
</tr>
</tbody>
</table>

*Jeon YW., Polich J.*

**P300 asymmetry in schizophrenia: a meta-analysis**

*Psychiatry Research 2001; 104: 61-74*

[View review abstract online](#)

**Comparison 1**

Comparison of P300 amplitude between topographical electrodes in schizophrenia vs. healthy controls

**Summary of evidence**

Moderate quality evidence (unable to assess sample size, precise, direct, mostly inconsistent) suggests P300 amplitude is reduced in schizophrenia compared to controls. This difference is of highest magnitude in the regions corresponding to the parietal electrode (parietal cortex). This difference is also lateralised, and has higher magnitude in the left hemisphere, particularly around the TCP1 electrode (left temporal lobe)
**Activity in midline electrodes**

*Meta-analysis considered schizophrenic patients and controls for P300 amplitude, comparing the FZ, CZ and PZ electrodes*

19 studies, 27 data sets, N not reported

**Overall**
Large effect size suggesting P300 amplitude is reduced overall in schizophrenia

\[ d = 0.86, \text{95\%CI 0.79 to 0.92, } Q_w = 158.49, p = 0.000 \]

**Frontal electrode (FZ)**

\[ d = 0.72, \text{95\%CI 0.61 to 0.84, } Q_w = 55.78, p = 0.001 \]

Moderate effect size suggesting P300 is reduced in frontal cortex

FZ-CZ \( Q_b = 2.71, p < 0.1 \)

**Central electrode (CZ)**

\[ d = 0.86, \text{95\%CI 0.75 to 0.97, } Q_w = 36.66, p = 0.1998 \]

Large effect size suggesting P300 is reduced in central cortex

CZ-PZ \( Q_b = 2.74, p < 0.1 \)

**Parietal electrode (PZ)**

\[ d = 1.00, \text{95\%CI 0.88 to 1.11, } Q_w = 55.20, p = 0.0013 \]

Large effect size suggesting P300 is reduced in parietal cortex

PZ-FZ \( Q_b = 10.86, p < 0.0005 \)

**Activity in Lateral electrodes**

*Meta-analysis considered schizophrenic patients and controls for P300 amplitude, comparing the T3, T4, TCP1 and TCP2 electrodes*

11 studies, 23 data sets, N not reported

**Left hemisphere**
Large effect size suggesting P300 amplitude is reduced over the left hemisphere in schizophrenia

\[ d = 0.85, \text{95\%CI 0.70 to 1.01, } Q_w = 57.85, p = 0.0001 \]

**Right hemisphere**
Moderate effect size suggesting reduced P300 amplitude over the right hemisphere in schizophrenia

\[ d = 0.61, \text{95\%CI 0.46 to 0.76, } Q_w = 41.89, p = 0.0093 \]

Right-Left \( Q_b = 4.93, p = 0.03 \)

**Left temporal electrode (T3)**
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<table>
<thead>
<tr>
<th>Consistency in results</th>
<th>Left temporal TCP1 electrode</th>
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<tbody>
<tr>
<td>Moderate effect size suggesting reduced P300 amplitude in left temporal cortex in schizophrenia</td>
<td></td>
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<tr>
<td>d = 0.79, 95%CI 0.61 to 0.97, $Q_w = 41.20, p = 0.0003$</td>
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<thead>
<tr>
<th>Right temporal electrode (T4)</th>
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<tbody>
<tr>
<td>Moderate effect size suggesting reduced P300 amplitude in right temporal cortex in schizophrenia</td>
</tr>
<tr>
<td>d = 0.61, 95%CI 0.44 to 0.78, $Q_w = 25.28, p = 0.0464$</td>
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| T3-T4 $Q_b = 1.99, p = 0.16$ |

<table>
<thead>
<tr>
<th>Left temporal electrode</th>
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<tbody>
<tr>
<td>Moderate effect size suggesting reduced P300 amplitude in left temporal cortex in schizophrenia</td>
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<tr>
<td>d = 0.61, 95%CI 0.31 to 0.91, $Q_w = 16.62, p = 0.0344$</td>
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| TCP1-TCP2 $Q_b = 4.11, p = 0.04$ |

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<thead>
<tr>
<th>Right temporal TCP2 electrode</th>
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<tbody>
<tr>
<td>Moderate effect size suggesting reduced P300 amplitude in right temporal cortex in schizophrenia</td>
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<tr>
<td>d = 0.61, 95%CI 0.31 to 0.91, $Q_w = 16.62, p = 0.0344$</td>
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</table>

Consistency in results

Significant heterogeneity reported in all lateral and in Pz and Fz categories, as well as between hemispheres and TCP categories, and Pz-Fz category

Precision in results

Precise for all outcomes

Directness of results

Direct comparison of topographical P300 amplitudes in schizophrenia and control

Jeon YW., Polich J.

Meta-analysis of P300 and schizophrenia: patients, paradigms and practical implications

Psychophysiology 2003; 40(5):684-701

View review abstract online

Comparison 1

Comparison of P300 amplitude and latency in schizophrenia vs. healthy control

Summary of evidence

Moderate quality evidence (moderate to large sample, precise, direct, inconsistent) suggests P300 amplitude is significantly reduced and P300 latency is significantly delayed in schizophrenia

These effects were significantly influenced by many sample,
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<table>
<thead>
<tr>
<th>patient and stimulus moderator variables</th>
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<tr>
<td><strong>P300 amplitude</strong></td>
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Meta-analysis compared schizophrenia and control for P300 amplitude and latency, measured at the mean response of PZ and CZ electrodes

**P300 amplitude**

**Oddball auditory paradigm**
Large effect size suggests significantly reduced amplitude in schizophrenia
N = 135, d = 0.89, 95%CI 0.84 to 0.94, Q_w = 288.5, p = 0.0000

**Oddball visual paradigm**
Small effect size suggests significantly reduced amplitude in schizophrenia
N = 21, d = 0.39, 95%CI 0.25 to 0.52, Q_w = 43.7, p = 0.0025

**Selective attention paradigm**
Small to moderate effect size suggests significantly reduced amplitude in schizophrenia
N = 15, d = 0.47, 95%CI 0.30 to 0.64, Q_w = 25.7, p = 0.0413

**Other paradigm (e.g. non-oddball, bimodal, somatosensory)**
Small effect size suggests significantly reduced amplitude in schizophrenia
N = 32, d = 0.28, 95%CI 0.16 to 0.40, Q_w = 119.4, p = 0.0000

**Overall**
Large effect size suggests significantly reduced amplitude in schizophrenia
N = 203, d = 0.74, 95%CI 0.69 to 0.78, Q_w = 602.5, p = 0.0000

**Q_b = 125.2, p < 0.0000001**

**P300 latency**

**P300 latency**

**Oddball auditory paradigm**
Moderate effect size suggests significantly increased latency in schizophrenia
N = 108, d = 0.59, 95%CI 0.54 to 0.65, Q_w = 426.4, p = 0.0000

**Oddball visual paradigm**
Small to moderate effect size suggests significantly increased latency in schizophrenia
N = 14, d = 0.49, 95%CI 0.31 to 0.68, Q_w = 36.4, p = 0.0009

**Selective attention paradigm**
Small effect size suggests significantly increased latency in schizophrenia
Other paradigm (e.g. non-oddball, bimodal, somatosensory)
Small effect size suggests significantly increased latency in schizophrenia

Overall
Moderate effect size suggests significantly increased latency in schizophrenia

Amplitude vs Latency: $r = 0.09, p = 0.40$; $Q_b = 28.6, p < 0.000001$

Subgroup analyses: Amplitude moderator variables, all paradigms together
The following moderator variables were associated with significantly reduced P300 amplitude
Paranoid subtype ($p < 0.0001$); earlier age of onset ($p < 0.0058$); percentage of males < 65% ($p = 0.0160$); high school level of education attained only ($p = 0.0130$); lower probability of target stimulus ($p = 0.006$); shorter interstimulus interval ($p = 0.0041$); shorter tone duration ($p = 0.0010$); lesser difference between target and standard stimulus ($p = 0.0029$); lower stimulus intensity ($p = 0.0379$); counting response modality ($p = 0.0343$); electrode at Cz location ($p < 0.0001$); ear reference location ($p = 0.0014$); high pass filter applied ($p = 0.0164$); and non-conventional amplitude measure ($p < 0.0001$)
Percentage of paranoid subtype was significantly correlated to effect size, $r = 0.50, p = 0.001$; as was sample size, $r = -0.21, p = 0.02$
No significant difference was reported for disease severity, disease duration, medication status, age, sample size, and target stimulus frequency.

Subgroup analyses: Latency moderator variables, all paradigms together
The following moderator variables were associated with increased (delayed) P300 latency (significance level $p<0.05$):
Paranoid subtype ($p < 0.0001$); moderate severity ($p = 0.0016$); acute duration ($p < 0.0001$); percentage of males < 65% ($p < 0.0001$); high school level of education attained only ($p = 0.0002$); younger age ($p < 0.0001$); larger sample size ($p < 0.0001$); lower probability of target stimulus ($p < 0.0001$); shorter interstimulus interval ($p = 0.0186$); lower stimulus intensity, dB ($p < 0.0001$); moderate target stimulus frequency Hz ($p < 0.0001$); electrode at Cz location ($p < 0.0001$); ear reference location ($p < 0.0001$); high pass filter applied ($p < 0.0001$); and non-conventional amplitude measure ($p < 0.0001$)
Percentage of paranoid subtype was significantly correlated to effect size, $r = 0.35, p = 0.04$; as was disease duration $r = -0.58, p < 0.0001$; percentage male $r = -0.47, p < 0.0001$; education years $r = -0.38, p = 0.016$; and sample size $r = 0.32, p = 0.001$
No significant difference was reported for age of onset, medication status, tone duration, and target/standard difference.
Subgroup analysis: Moderator variables for oddball auditory paradigm

| Consistency in results | Significant heterogeneity reported in all outcomes of meta-analysis  
| Stimulus difference was significantly correlated to amplitude effect size $r = -0.2245, p = 0.012$ and to latency effect size, $r = 0.251, p = 0.012$  
| Stimulus intensity was significantly correlated to latency effect size, $r = -0.36, p < 0.001$, as was target frequency $r = 0.28, p = 0.006$  

| Precision in results | Precise for all outcomes  

| Directness of results | Direct comparison of P300 activity in schizophrenia and control  

Explanation of acronyms

CI = Confidence Interval, CZ = central electrode, $d$ = Cohen’s $d$ and $g$ = Hedges’ $g$ = standardized mean differences (see below for interpretation of effect sizes), EEG = electroencephalogram, ERP = event-related potential, FZ = frontal lobe electrode, N = number of participants, $p$ = statistical probability of obtaining that result ($p < 0.05$ generally regarded as significant), PZ = parietal lobe electrode, Q = Q statistic (chi-square) for the test of heterogeneity in results across studies, $Q_b$ = between group heterogeneity, $Q_w$ = within group heterogeneity, SE = standard error, T3/ TCP1= Left temporal lobe electrodes, T4/TCP2 = Right temporal lobe electrodes, 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[8].

† Different effect measures are reported by different reviews.

Weighted mean difference scores refer to mean differences between treatment and comparison groups after treatment (or occasionally pre to post treatment) and in a randomized trial there is an assumption that both groups are comparable on this measure prior to treatment. Standardized 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. 0.2 represents a small effect, 0.5 a moderate effect, and 0.8 and over represents a large treatment effect[8].

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).

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 large effect is considered if RR > 2 or < 0.5 and a very large effect if RR > 5 or < 0.2[9]. InOR stands for logarithmic OR where a lnOR of 0 shows no difference between groups. Hazard ratios measure the effect of an explanatory variable on the hazard or risk of an event.

Correlation coefficients (eg, r) indicate the strength of association or relationship between variables. They 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. Unstandardized (b) regression coefficients indicate the average change in the dependent variable associated with a 1 unit change in the dependent variable,
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statistically controlling for the other independent variables. Standardized regression coefficients represent the change being in units of standard deviations to allow comparison across different scales.

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.

‡ Inconsistency refers to differing estimates of treatment 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 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, this criteria should be relaxed[9].

|| 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 so is 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.

Many thanks to Dr Juanita Todd for reviewing this summary of evidence

School of Psychology, University of Newcastle
TECHNICAL COMMENTARY

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References