TECHNICAL COMMENTARY

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Obesity

Introduction

Obesity is defined as abnormal or excessive fat accumulation that presents a risk to health. A crude population measure of obesity is the body mass index (BMI), which is a person's weight divided by the square of his or her height. A person with a BMI of 30 or more is generally considered obese. Being obese is a major risk factor for diabetes, cardiovascular diseases and cancer.

People with a severe mental illness are at increased risk of obesity, which may be due to genetic and/or socio-economic factors, lifestyle choices, and metabolic effects of many psychotropic medications.

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 2010 that report results separately for people with bipolar or related disorders. Reviews were identified by searching MEDLINE, EMBASE, and PsycINFO. Hand searching reference lists of identified reviews was also conducted. When multiple copies of review topics were found, only the most recent and/or comprehensive review 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[1]. Reviews rated as having 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, 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)[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 four systematic reviews that met our inclusion criteria[3-6].

- Moderate quality evidence finds a small, increase in the rate of obesity in people with bipolar disorder compared to people without the disorder. The rate of obesity in children and adolescents with bipolar disorder is around 15%.
- Moderate to low quality evidence finds obesity in people with bipolar disorder is associated with worse symptoms and functioning.
- Moderate quality evidence finds weight loss following bariatric surgery is similar in people with bipolar disorder and controls.

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Cerimele JM, Katon WJ

Associations between health risk behaviors and symptoms of schizophrenia and bipolar disorder: a systematic review

General Hospital Psychiatry 2013; 35: 16-22

View review abstract online

Comparison	**The effect of obesity on symptoms and functioning in people with bipolar disorder vs. non-obese people with bipolar disorder.**
Summary of evidence	**Moderate to low quality evidence (small studies, unable to assess consistency or precision, direct) suggests obesity in people with bipolar disorder is associated with poorer symptoms and functioning.**
Symptoms	
1, 2-year study, N = 175 found that obesity in people with bipolar disorder was associated with worse symptoms and more hospitalisation.	
Functioning	
1, 1-year study, N = 46 found that obesity in people with a first-episode of mania or mixed symptoms was associated with poorer functioning.	
Consistency in results‡	N/A; one study for each outcome.
Precision in results§	Unable to assess; no CIs reported for bipolar disorder.
Directness of results‖	Direct

Girela-Serrano BM, Guerrero-Jimenez M, Spiers ADV, Gutierrez-Rojas L

Obesity and overweight among children and adolescents with bipolar disorder from the general population: A review of the scientific literature and a meta-analysis

Early Intervention in Psychiatry 2021; doi: 10.1111/eip.13137

View review abstract online

Comparison	**Rate of obesity in children and adolescents with bipolar**

	disorder (age 7 to 17 years).
Summary of evidence	**Moderate quality evidence (large sample, inconsistent, appears precise, direct) finds the rate of obesity in children and adolescents with bipolar disorder is around 15%.**
Obesity	
The prevalence of obesity in children and adolescents with bipolar disorder was 15%; 4 studies, N = 2,559, prevalence = 15%, 95%CI 11% to 20%, I^2 = 84%	
Consistency in results	Inconsistent
Precision in results	Appears precise
Directness of results	Direct

Kouidrat Y, Amad A, Stubbs B, Moore S, Gaughran F

Surgical Management of Obesity Among People with Schizophrenia and Bipolar Disorder: a Systematic Review of Outcomes and Recommendations for Future Research

Obesity Surgery 2017; 27: 1889-95

View review abstract online

Comparison	**Bariatric surgery in people with bipolar disorder vs. controls.**
Summary of evidence	**Moderate quality evidence (large samples, unable to assess consistency or precision, direct) suggests weight loss following bariatric surgery is similar in people with bipolar disorder and controls, with no differences in psychiatric symptoms.**
Weight	
7 studies, N = 1,122, found weight lost following surgery was similar in people with bipolar disorder and controls without bipolar disorder (over 1-2 years post-surgery).	
Symptoms	
1 study, N = 1,884 found no significant differences in the use of psychiatric services in people with bipolar disorder and controls without bipolar disorder (over 2 years post-surgery). 1 study, N = 15 found six patients suffered from symptom relapse.	

Consistency in results	N/A; one study for each outcome.
Precision in results	Unable to assess; no CIs are reported.
Directness of results	Direct

Zhao Z, Okusaga OO, Quevedo J, Soares JC, Teixeira AL

The potential association between obesity and bipolar disorder: A meta-analysis

Journal of Affective Disorders 2016; 202: 120-3

View review abstract online

Comparison	**Rate of obesity in people with bipolar disorder vs. controls.**
Summary of evidence	**Moderate quality evidence (large samples, inconsistent, imprecise, direct) suggests a small, significant increase in the rate of obesity in people with bipolar disorder compared to people without bipolar disorder.**
Obesity	
A small, significant effect of increased rates of obesity in people with bipolar disorder; 9 studies, N = 627,749, OR = 1.77, 95%CI 1.40 to 2.23, $p < 0.001$, $I^2 = 82.1\%$ Subgroup analyses revealed larger effects were associated with smaller studies, and studies that adjusted for only one or no covariates compared to two or more covariates.	
Consistency in results	Inconsistent
Precision in results	Imprecise
Directness of results	Direct

Explanation of acronyms

CI = confidence interval, I^2 = the percentage of the variability in effect estimates that is due to heterogeneity rather than sampling error (chance), N/A = not applicable, OR = odds ratio, *p* = statistical probability of obtaining that result ($p < 0.05$ generally regarded as significant), 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[7].

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† Different effect measures are reported by different reviews.

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[8]. lnOR 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.

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 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) 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 moderate effect, and 0.8 and over represents a large effect[7].

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 unforseen 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 independent variable, 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.

‡ 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[7];

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

§ 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[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 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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