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Project: Cognitive functioning in individuals with obesity: a systematic review

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Introduction:

Obesity is a significant health concern in New Zealand and the problem is increasing in severity as one in three aged 15 and over in New Zealand are now classified as obese. This multifactorial epidemic is influenced by socioeconomic factors, our toxic food environment, genetics and other contributing factors. Apart from weight loss surgery, current behavioural weight loss programmes for obesity consist of nutritional counselling, dietary restriction and exercise. The weight loss literature however finds that dieting is ineffective in maintaining long-term weight reduction. One potential explanation being examined for the poor outcomes of these interventions is cognitive dysfunction in obese individuals. Cognitive dysfunction can result in impaired ability to maintain awareness of long term goals, and could justify decreased long term adherence to weight loss interventions. If this explanation is supported, then cognitive remediation therapy could potentially be added to treatment for obesity, augmenting current behavioural interventions. Earlier reviews reported some evidence of cognitive impairment in those with obesity, however widespread methodological flaws across studies tempered the conclusions that could be made. Nevertheless, several studies are underway trialling cognitive remediation as a component of treatment for those with obesity. An updated systematic review re-examining the relationship between obesity and cognitive function is required.

Aim:

The aim of our systematic review is to establish the magnitude of differences in cognitive functioning in obese adults compared to non-obese control groups

Method:

This systematic review was undertaken according to the 2009 PRISMA Statement. The protocol for this review was registered on PROSPERO. A comprehensive electronic search for articles was conducted on the databases MEDLINE, PsycINFO, EMBASE and the Cochrane Library using selected keywords. A hand-search of articles was also conducted. The title and abstract of the potential articles were first screened by two authors. The full texts of the relevant studies was then reviewed by the same two authors to identify if they met the eligibility criteria. Articles were excluded if they investigated individuals under 18 years or aged 66 and over, and were not published in English. Included studies had to use validated neuropsychological tests to assess the outcome and report a quantifiable measure of association between the exposure and the outcome. Only studies published in the last three years were included.

There were 14 articles included in the final article sample for our review. The important characteristics and data from each study was recorded on a data extraction form. Quality ratings were made on each study (Newcastle-Ottawa Scale) and across neuropsychological domains using GRADE criteria.

Results:

Out of the fourteen studies in our final sample (n=1967), only half included a healthy (non-obese) control group.

The domains of executive function (set shifting, impulsivity, response inhibition), psychomotor speed and working memory were assessed using neuropsychological tests including the Maze test, Wisconsin Card Sort test (WCST), Stop Signal Reaction Time Task, Go-No-Go task, Iowa Gambling task, Trail Making Test, Digit Span test and the Stroop test.

Three studies measured set shifting using the WCST. Two of these studies found significant impairment in the obese group. Motor impulsivity was measured in five studies using the Stop Signal Reaction Time task or the Go-No-Go test. Three of five studies found that the obese group performed worse than control groups. No significant difference was found between obese and control group performances in the other domains.

Conclusion:

Although there were mixed findings on some domains, our results from our final sample provides some support for previous findings that obesity is associated with deficits in the executive function domain, specifically in set shifting and motor impulsivity. The effect size difference for motor impulsivity was small. Our findings on psychomotor speed and memory tasks were inconsistent with previous reviews. Because our systematic review only contained studies from the past three years, further examination of studies included in our review with previous reviews needs to be completed in order to understand these mixed findings.

There was some methodological flaws in our review. The majority of the studies in our final sample did not control for medical comorbidities such as diabetes or hypertension, and none controlled for socioeconomic status. Eight of the studies did not use a control group. Eight studies used a morbidly obese sample, it is possible that conclusions made using those studies may not be across BMI levels within the obese population. For example, cognitive deficits may be greater in those with morbid obesity who also have more medical comorbidity, so more research needs to be conducted to establish whether there is a linear relationship between BMI and the extent of cognitive impairment.

The important confounding factors noted above mean that definitive conclusions about an independent relationship between obesity and cognitive function cannot be made. It is essential that future research controls for confounding factors such as comorbidities, socioeconomic status and extent of obesity.