



Validation of the Behaviour Rating Inventory of Executive Function – Adult Version (BRIEF-A) in the obese with and without binge eating disorder



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ARTICLE INFO

Article history:

Received 8 December 2015

Received in revised form 16 June 2016

Accepted 13 July 2016

Available online 15 July 2016

Keywords:

Obesity

Binge eating disorder

Executive function

BRIEF-A

Psychometrics

ABSTRACT

Obesity and binge eating disorder (BED) are both associated with deficiencies in executive function. The Behaviour Rating Inventory of Executive Function – Adult Version (BRIEF-A) is a self-report measure that assesses executive function. This study aimed to examine the psychometric properties of the BRIEF-A in an obese population, with and without BED, and to explore the differences on the BRIEF-A in the obese, with and without BED, compared to normative sample. 98 obese participants (70 BED) completed the BRIEF-A, DASS-21 and several performance-based measures of executive function. 30 participants completed a repeat assessment two months later. There was evidence of good internal consistency and test-retest reliability, however evidence for construct and convergent validity was mixed. Additionally, it was found that obese individuals report significantly more executive function difficulties on the BRIEF-A than the normative sample. Further, obese with BED report more executive function difficulties than those without. This study shows some evidence of sound psychometric properties of the BRIEF-A in an obese sample, however more research is required to understand the nature of executive function being measured.

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1. Introduction

Obesity, defined as having a body mass index larger than 30 kg/m², is considered an epidemic with 600 million people being classified as obese worldwide (World Health Organization, 2015). Prevalence studies have found 20% of overweight and obese individuals suffer from binge eating disorder (BED; Darby et al., 2009), an eating disorder characterised by weekly episodes of binge eating in the absence of regular compensatory behaviours such as vomiting or laxative abuse (American Psychiatric Association, 2013). Obesity and BED are both serious conditions that would benefit from research elucidating their maintaining factors.

Obese individuals have been found to have lower executive function compared to their normal weight counterparts (Smith, Hay, & Trollor, 2011). Executive function encompasses a diverse range of cognitive processes and behavioural competencies facilitating initiation, planning,

regulation, sequencing and achievement of complex goal-oriented behaviour and thought (Stuss & Benson, 1996). Importantly, these deficits are found even when controlling for socioeconomic status (McLaren, 2007) and medical comorbidities (Boeka & Lokken, 2008; Elias, Elias, Sullivan, Wolf, & D'Agostino, 2003). There are many different measures currently employed to assess different aspects of executive function. For example, the Trail Making Test and the Stroop test assess flexibility and inhibition; the Wisconsin Card Sorting Test and the Booklet Category Test assess problem solving and perseveration; the Iowa Gambling Test assesses decision-making and reward sensitivity; and the Rey Complex Figure Test assesses planning, organisation and central coherence. However, some measures of executive function can be time intensive to administer or may lack ecological validity (Rabin et al., 2006). In addition, some measures rely heavily on the novelty of the task to assess problem solving, thus frequent and recent retesting is not advised as it minimises the novel aspect of the task (Lezak, Howieson, & Loring, 2004). Therefore, in a clinical setting where executive function is monitored over time these tools are not ideal. Instead, a self-report measure such as the Behaviour Rating Inventory of Executive Function – Adult Version (BRIEF-A) may be useful. The BRIEF-A assesses a range of executive function domains and how they impact on daily life (Roth, Isquith,

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& Gioia, 2005). It is quick and easy to administer and can be used to monitor changes over time. In addition, it has good ecological validity as it assesses the impact of executive function difficulties in common situations and everyday tasks.

The BRIEF-A has been validated as a tool to identify executive function deficiencies in a number of clinical populations. It has been shown to be sensitive to executive function deficiencies in adults with Attention Deficit Hyperactivity Disorder (Roth et al., 2005); Alzheimer's Disease and Mild Cognitive Impairment (Rabin et al., 2006; Roth et al., 2005); Multiple Sclerosis (Roth et al., 2005) and Traumatic Brain Injury (Roth et al., 2005; Waid-Ebbs, Wen, Heaton, Donovan, & Vellozo, 2012). More recently, the BRIEF-A has been validated in an eating disorders population, comprising individuals with anorexia nervosa, bulimia nervosa and BED (Ciszewski, Francis, Mendella, Bissada, & Tasca, 2014). This study found that the BRIEF-A was a reliable and valid measure to use with an eating disorder population, with a high internal consistency of the two index scores (Metacognition Index and Behavioural Regulation Index), and the Global Executive Composite (GEC; $\alpha = 0.96$). Further, this study demonstrated high convergent and construct validity for the BRIEF-A (Ciszewski et al., 2014). Additionally, it was sensitive to the different executive function difficulties associated with anorexia nervosa and bulimia nervosa. However, although BED patients were included, they formed only a small component of the sample and their results on the BRIEF-A were not reported separately.

The BRIEF-A has also been found to be associated with other related measures, including depression and anxiety, as they are also related to executive function (Ciszewski et al., 2014; Petry, Barry, Pietrzak, & Wagner, 2008; Roth et al., 2005). Results thus suggest that the BRIEF-A has good convergent validity. However, correlations with performance-based measures of executive function have not been found (Rabin et al., 2006). This may suggest that the BRIEF-A is perhaps measuring a different aspect of executive function.

The BRIEF-A has been found to have good reliability and validity in a number of different populations. However, this has not been examined in an obese or BED population. Therefore, the first aim of this study was to assess the psychometric properties of the BRIEF-A in an obese population, with and without BED.

A limited number of studies have compared executive function for obese individuals with BED and those without BED. It has been found that deficiencies were comparable for obese with BED and obese without BED on measures of inhibition, mental flexibility and problem-solving (Galioto et al., 2012) and decision-making (Danner, Ouweland, van Haastert, Hornsveld, & de Ridder, 2012; Davis, Patte, Curtis, & Reid, 2010). In contrast to these findings, one study found that individuals with BED demonstrated poorer decision-making compared to an overweight/obese sample ($BMI > 25 \text{ kg/m}^2$; Svaldi, Brand, & Tuschen-Caffier, 2010). Further studies have shown that obese individuals with BED disorder presented greater executive deficits compared to obese individuals without BED, especially in problem-solving, cognitive flexibility and working memory tasks (Mobbs, Iglesias, Golay, & Van der Linden, 2011; Monica et al., 2010).

Similarly, difficulties with decision-making increased with increasing levels of binge eating severity (Danner et al., 2012). This may suggest that binge eating is more predictive of executive function deficiencies than BMI alone. The second aim of this study was to compare executive function in obese individuals with BED and without BED.

The purpose of this study was to better understand the utility of the BRIEF-A as a measure of executive function in an obese population, with and without BED. Firstly, the psychometric properties of the BRIEF-A were examined. The reliability of the BRIEF-A was evaluated through internal consistency and test-retest stability. Content validity was assessed by conducting an exploratory factor analysis to explore the application of a two factor model to the BRIEF-A as proposed by Roth et al. (2005). Convergent validity of the BRIEF-A was examined in an obese population, with and without BED. It was expected that the BRIEF-A would demonstrate good reliability and validity in this population.

Secondly, this study sought to examine self-report executive function difficulties on the BRIEF-A for obese individuals with and without BED. It was expected that those with obesity, regardless of BED diagnosis, would report more executive function difficulties on the BRIEF-A compared to the normative sample. Differences in the extent of executive function difficulties between obese individuals with BED and obese individuals without BED were also explored.

2. Method

2.1. Participants

One hundred obese individuals were recruited through community advertisements in Sydney, Australia to participate in a larger randomised controlled trial investigating a treatment for obesity (Raman, Hay, & Smith, 2014). Inclusion criteria were $BMI \geq 30$, age 18–55 years, current weight under 180 kg, ability to provide informed consent and completion of 10 years of education in English. Participants were excluded if they had a history of psychosis, head injury, neurological disorder including degenerative or inflammatory conditions or stroke, ADHD, epilepsy, developmental or intellectual disability, were unable to complete the testing (e.g. due to hearing, vision or language impediment), were on regular sedative or stimulant medication, report substance regular use/abuse (for alcohol, >2 standard drinks 5 times a week), and/or they regularly used sedatives, hypnotics, antipsychotics, anti-cholinergic or cholinergic medications.

Of these participants, two were excluded as they did not complete the BRIEF-A. Nine participants had scores outside the expected range on one of the three validity scales, however, these participants were retained as their scores on the other validity measures were within the normal range. This resulted in a sample of 98 obese individuals, with 15 males and 83 females. Mean age was 41.4 ($SD = 7.92$, range 18–55) and mean years of education completed was 14.5 ($SD = 2.48$, range 10–20). Mean BMI was 39.3 ($SD = 7.14$, range 30.1–60.2). 70 participants (71.4%) were diagnosed as having binge eating disorder (BED) using DSM-5 diagnostic criteria (American Psychiatric Association, 2013). Gender representation for both groups was comparable, with females making up 83% and 78% of the BED and non-BED group, respectively. Of the participants diagnosed with BED, 27 were classified as Mild, 35 as Moderate and 8 as Severe. All participants provided informed consent and were reimbursed for their time. The Human Research Ethics Committee of the Western Sydney University and the University of New South Wales approved this study.

2.2. Measures

2.2.1. BRIEF-A

The BRIEF-A captures information on an adult's own perception of his or her executive function or self-regulation in his or her everyday environment. It is composed of 75 items, forming nine clinical scales, two index scores and a global composite score. The BRIEF-A takes approximately 10 min to complete. Participants indicate how often each item has been a problem over the past month, where response choices are "never", "sometimes" or "often". Higher scores indicate more difficulties with executive function.

The clinical scales are Inhibit, Shift, Emotional Control, Self-Monitor, Initiate, Working Memory, Plan/Organise, Task Monitor and Organisation of Materials. This produces 2 index scores: Behaviour Regulation Index and Metacognition Index. The Behaviour Regulation Index (BRI) provides a measure of the ability to regulate behaviour and emotional responses. The BRI is based on clinical scales Inhibit, Shift, Emotional Control and Self-Monitor. The Metacognition Index (MCI) measures the ability to solve problems in a systematic way using skills such as planning, organisation and working memory. The MCI is based on the clinical scales Initiate, Working Memory, Plan/Organise, Task Monitor and Organisation of Material. All nine clinical scales sum to produce a

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