



## Research report

# A longitudinal investigation of overweight children's body perception and satisfaction during a weight management program <sup>☆</sup>



Jacklin N. O'Connor <sup>a,\*</sup>, Rebecca K. Golley <sup>b</sup>, Rebecca A. Perry <sup>c</sup>, Anthea M. Magarey <sup>c</sup>, Helen Truby <sup>a</sup>

<sup>a</sup> Department of Nutrition and Dietetics, Monash University, Notting Hill, Victoria, Australia

<sup>b</sup> Public Health Group, Sansom Institute of Health Research, University of South Australia, South Australia, Australia

<sup>c</sup> Nutrition and Dietetics, Flinders University, South Australia, Australia

## ARTICLE INFO

## Article history:

Received 22 January 2014

Received in revised form 2 November 2014

Accepted 6 November 2014

Available online 13 November 2014

## Keywords:

Child

Obesity

Treatment

Body perception

Body satisfaction

## ABSTRACT

**Background:** The Children's Body Image Scale (CBIS) is a measure of body perception and satisfaction. Obesity has a negative impact on children's body satisfaction. This study aimed to (1) determine the construct validity of the CBIS in a purely overweight/obese sample, and (2) explore longitudinal changes in body perception and satisfaction in overweight/obese children participating in a six month weight management program delivered to parents. Data were self-reported by overweight/obese 5 to 9 year old children ( $n = 127$ ) over a 36 month period. **Findings:** The CBIS demonstrated good construct validity ( $Rho$ : range 0.38 to 0.71,  $p < 0.05$ ). Accuracy in body size perception did not alter significantly over time ( $Rho$ : range 0.45 to 0.59,  $p < 0.001$ ). No consistent differences in body satisfaction by age or sex were observed. Body satisfaction improved after the six month weight management intervention (mean difference = 0.74, 95% CI 0.15–1.26) which was maintained at 36 month follow up. **Conclusion:** The CBIS is a useful measure to monitor overweight/obese children's body satisfaction. In this cohort, it is suggestive that the child weight management program delivered to parents did not impact negatively on children's body satisfaction.

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## Introduction

Childhood obesity is known to affect both physical and psychosocial domains of health (Ebbeling, Pawlak, & Ludwig, 2002). Overweight children experience higher levels of body dissatisfaction compared with their non-overweight counterparts (Lombardo, Battagliese, Pezzuti, & Lucidi, 2013), indicating that larger body size impacts negatively on children's experience of their bodies. Negative body image is implicated in the development of extreme dieting behaviours which can be the precursor of eating disorders (Smolak,

2004). Despite this, there is a lack of research on body satisfaction in overweight children and how weight management interventions may alter this over time.

In a recent review of children's views on body size and shape (Rees, Oliver, Woodman, & Thomas, 2011), only 3/28 studies included overweight or obese children. Further, only 3/64 studies (Braet, Tanghe, Decaluwe, Moens, & Rosseel, 2004; Golley, Magarey, Baur, Steinbeck, & Daniels, 2007; McCallum et al., 2007) from the 2009 Cochrane review on childhood obesity interventions (Oude Luttikhuis et al., 2009) included body satisfaction as an outcome. Measures of body satisfaction that have been validated in overweight or obese children are scarce (Lombardo et al., 2013; Rees et al., 2011), and this may be one reason for the lack of data on the relationship between children's body satisfaction and weight loss.

The Children's Body Image Scale (CBIS) is a pictorial scale that has been used widely to measure pre-adolescent children's self-perception of their body size and further to elucidate what their ideal body size would be (Truby & Paxton, 2002, 2008). Williamson, Gleaves, Watkins, & Schlundt (1993) first described and validated the use of self-ideal discrepancy scores as a method to measure body dysphoria in pre-adolescents in 1993. The construct validity of the CBIS as a measure of body satisfaction was supported by medium-strong correlations when tested in a cohort of 153 7–12 year old children across a range of BMI percentiles (Truby & Paxton, 2002). The CBIS was also shown to be reliable in this sample (Truby &

<sup>☆</sup> **Acknowledgements:** We thank the children and families for participating in the study. The HELPP study was funded by the Australian Health Management Group Assistance to Health and Medical Research Fund. The PEACH study was primarily funded by Australian National Health and Medical Research Council grant 275526. Additional funding was provided by the New South Wales Centre for Overweight and Obesity. Dr R Golley was supported by a National Health and Medical Research Council postgraduate research scholarship (229978) and a National Heart Foundation postdoctoral fellowship (PH11A5068). Dr R Perry was supported by a National Health Foods Australia Postgraduate scholarship and an Australian National Health and Medical Research Council postgraduate research scholarship (grant 375184). The funding sources had no role in the design, implementation, analysis, or interpretation of this study or in writing the report or the decision to submit. **Conflict of interest:** The authors have no competing interests to declare.

\* Corresponding author.

E-mail address: [jacklin.oconnor@gmail.com](mailto:jacklin.oconnor@gmail.com) (J.N. O'Connor).

Paxton, 2002). The CBIS comprises a sex-specific scale of seven black and white photographs of children of known BMI. When categorised according to the International Obesity Task Force (IOTF) BMI cut off points (Cole, Bellizzi, Flegal, & Dietz, 2000) boy figures 5, 6 and 7 are classified as overweight, obese and obese categories respectively and girl figures 5, 6 and 7 represent overweight, overweight and obese categories respectively.

To date, the construct validity of the CBIS as a measure of body satisfaction has been tested primarily in cohorts spanning a range of BMIs (Truby & Paxton, 2002). These studies have not investigated whether its validity alters in overweight and obese children. Therefore this study aimed to (1) determine the construct validity of the CBIS in a purely overweight/obese sample and (2) explore longitudinal changes in body perception and satisfaction in overweight/obese children participating in a six month weight management program delivered to parents.

## Subjects and methods

### Data and sample description

Data were from two Australian child weight management studies – the Healthy Eating and Lifestyle through Positive Parenting (HELPP) and the Parenting, Eating & Activity for Child Health (PEACH™) randomised controlled trials (RCTs) (Golley et al., 2007; Golley, Perry, Magarey, & Daniels, 2007; Magarey et al., 2011). Families were recruited from the community (i.e. via media publicity, school newsletters) and the studies were conducted through three metropolitan teaching hospitals. Further details of recruitment are provided in the respective results papers (Golley et al., 2007; Magarey et al., 2011). The study selection criteria were 5- to 9-year-old prepubertal, overweight/mildly obese (IOTF definition, BMI z score < 4.0), otherwise healthy (i.e. no co-morbidities) children (Golley et al., 2007; Magarey et al., 2011). The intervention was a six month parenting-skills training plus lifestyle education program delivered to parents of 5- to 9-year-old children (Golley et al., 2007). The lifestyle intervention was similar in both studies and did not specifically focus on children's weight loss; rather it provided parents with knowledge and skills to support them to establish appropriate child and family weight-related lifestyle behaviours, such as choosing lower fat foods and reducing sedentary behaviours (Golley et al., 2007).

### Measures and data collection

The CBIS was employed as an outcome measure to assess the impact that the interventions had on the children's body satisfaction. Children were weighed and measured by trained researchers and BMI was calculated ( $\text{kg}/\text{m}^2$ ) and converted to a BMI z score by using United Kingdom reference data provided as a computer program (Child Growth Foundation, London, United Kingdom) (Golley et al., 2007; Magarey et al., 2011). The CBIS (Truby & Paxton, 2002) was administered to children by trained researchers, who were blinded to randomisation, at baseline, 6, 12, 18 and 36 months. Children completed the CBIS via a standardised interview process (Truby & Paxton, 2002). Questions were read to children individually in a quiet room without parents present. The interview was structured such that children could clarify questions and built in prompts were used to check children understood the task and that their answers accurately reflected their feelings. Following adequate time and repeating of the question, children were able to choose not to answer the question.

Children were shown an A4 page on which the seven sex relevant CBIS figures were depicted and asked to identify the figure they believed looked most like themselves (perceived body size). The difference between a child's actual measured BMI and their perceived

CBIS figure (actual-perceived discrepancy score) was a measure of accuracy of *body image perception*. A score of 0 (i.e. no discrepancy) indicates that the child was able to accurately determine their body size. A positive (high) score indicates a child perceives themselves as thinner than they actually are.

The children were then asked to pick the CBIS figure that they would most like to look like (desired body size); the difference between children's perceived and desired figure (perceived-desired discrepancy score) was a measure of *body image satisfaction*. The CBIS body satisfaction ranges from -6 to +6 with 0 indicating satisfied with body (i.e. no discrepancy). Both +6 and -6 indicate dissatisfaction: positive indicates they are dissatisfied and want to be thinner, negative indicates they are dissatisfied and want to be fatter.

### Data analyses

Statistical analyses were performed using IBM-SPSS for Windows v20. Analyses included participants for whom data at all relevant points were available (i.e.  $n = 126$  and  $n = 75$  at 12 and 36 months respectively). The CBIS body satisfaction score is ordinal data, but as is convention, scores were treated as interval data, with means and standard deviations presented (Truby & Paxton, 2002).

Construct validity was assessed using Spearman's correlation to compare the CBIS body satisfaction score with responses to two questions: the first relating to *perceived body image* ('Do you think your body is: (1) much too thin; (2) a little too thin; (3) just right; (4) a little too fat or (5) much too fat?') and the second relating to *desired body image* ('Would you like your body to be: (1) a little thinner; (2) stay the same; (3) a little fatter or (4) much fatter?'). Data were collected for three consecutive years so at the end of the studies, the oldest children were 12 years. Data were found to have equality of variance of residuals. The main effect of time (factor variable 0, 6, 12, 18 and 36 months) on BMI z score, CBIS body perception and satisfaction scores (outcome variables) were examined via repeated measures ANOVA. Post hoc analysis was performed using the Bonferroni method. The Mann-Whitney U test was used to determine whether there were sex and age differences in body perception and satisfaction.

## Results

Data were available for 126/244 children with complete data at baseline, 6 and 12 months (45% and 53% from the PEACH and HELPP studies respectively), with complete data to 36 months available for 75/244 participants (31% and 29% from the PEACH and HELPP studies respectively). There were no significant differences between the completers used in this analysis and all study participants with respect to sex ( $p = 0.92$ ), age ( $p = 0.99$ ) or baseline BMI z score ( $p = 0.34$ ). In the sample analysed, the majority of children were female (59%), the average age at baseline was  $8.2 \pm 1.1$  years and baseline BMI z scores ranged from 1.35 to 3.92. Mean baseline BMI z score was  $2.68 \pm 0.58$  (i.e. 99.6th percentile) and was significantly lower at six months, i.e. end of the intervention ( $2.43 \pm 0.66$ ,  $p < 0.001$  i.e. 99.2nd percentile) and 36 months ( $2.33 \pm 0.75$ ,  $p < 0.001$  i.e. 99.0th percentile) compared to baseline.

The construct validity of the CBIS as a measure of body satisfaction was supported by medium-strong correlations which tended to increase over time (Table 1). A positive correlation indicates that as CBIS body satisfaction scores become more positive (i.e. children want to be thinner), children perceive themselves as being heavier on the perceived body image question. A negative correlation indicates that as CBIS body satisfaction scores become more positive (i.e. children want to be thinner), children reported more desire to be thinner on the desired body image question. No consistent sex or age differences within time points were observed.

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