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Research report

Measuring behavioural susceptibility to obesity: Validation of the child eating behaviour questionnaire

Susan Carnell, Jane Wardle*

Department of Epidemiology and Public Health, University College London, Gower Street, London WC1E 6BT, UK

Abstract

The Child Eating Behaviour Questionnaire (CEBQ; [Wardle, J., Guthrie, C.A., Sanderson, S., & Rapoport, L. (2001). Development of the children's eating behaviour questionnaire. *Journal of Child Psychology and Psychiatry*, 42, 963–970]) is a parent-report questionnaire designed to assess eating styles related to obesity risk. It has been shown to have a robust factor structure and good internal reliability, but has not been validated against behavioural measures of eating. In the present study, associations were examined between three CEBQ scales (Satiety Responsiveness, SR; Food Responsiveness, FR; Enjoyment of Food, EF) and four aspects of eating behaviour (eating without hunger, caloric compensation, eating rate and energy intake at a meal) aggregated across up to five occasions, in a sample of 4–5-year olds. In multiple regression, the aggregated behavioural measures of eating explained 56% of the variance in SR, 33% of the variance in FR and 40% of the variance in EF. These findings support the validity of the CEBQ as a parent-report instrument to assess 'obesogenic' eating behaviours in children. An easily-administered measure such as the CEBQ will be valuable in gathering data on the scale required to study the behavioural phenotype associated with obesity risk.

Keywords: Preload; Intake regulation; Eating in the absence of hunger; Overweight; Phenotype; Psychometric; Food cues; Satiety sensitivity

Introduction

There is increasing recognition that phenotypic variation in adiposity is the result of interactions between individual susceptibility and exposure to an 'obesogenic' environment (Barsh, Farooqi, & O'Rahilly, 2000; Flier, 2004; Hill, Wyatt, Reed, & Peters, 2003). Individual susceptibility is usually analysed at the level of biological mechanisms (e.g., genes and hormones) but it is equally important to consider behavioural processes (Blundell & Finlayson, 2004; Blundell & Gillett, 2001). We are now seeing a revival of enthusiasm for putting the behaviour into the behavior genetics of obesity (Faith, Johnson, & Allison, 1997), and as part of this, renewed interest in measuring behavioural traits that confer susceptibility to the obesogenic environment (Wardle, Guthrie, Sanderson, & Rapoport, 2001).

Experimental laboratory studies in both children and adults have identified a cluster of behaviours which may confer obesity risk. For example, results suggest that obese people, on average, have stronger appetitive responses to food cues (eating without hunger, cephalic-phase responding, palatability responsiveness, reinforcing value of food) than normal-weight people (Epstein, Paluch, & Coleman, 1996; Fisher & Birch, 1999; Nisbett, 1968; Saelens & Epstein, 1996). Other studies suggest that a related group of behaviours (preload insensitivity, higher eating speed), which could implicate lower responsiveness to internal cues of satiety, are also more common in the obese (Barkeling, Ekman, & Rossner, 1992; Wardle, 2006).

Laboratory experiments have the advantage of providing objective measures of eating behaviour, but they also have significant limitations in their application to human obesity. The fact that many studies use only a single behavioural measure (e.g., responsiveness to a preload) limits generalisation from that instance of the behaviour to the underlying trait (Epstein, 1983). Restriction of testing to a single occasion means that the outcome is vulnerable to the numerous extrinsic factors at play on that day; that is, behaviour is always a state measure, even if it is being

*Corresponding author. Tel.: +44 20 7679 6627; fax: +44 20 7813 2848.
E-mail address: j.wardle@ucl.ac.uk (J. Wardle).

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used to impute traits. Reflecting this uncertainty, results of behavioural analyses have usually been used for group comparisons (e.g. normal weight vs. obese) rather than as a marker of an individual's position on the hypothesised continuum of obesity susceptibility. Practical limitations also arise from the difficulty and expense associated with setting up behavioural tasks on the scale needed to provide adequate statistical power given that effects are likely to be small.

An alternative strategy is to use psychometric measures of behavioural traits (Braet & Van Strien, 1997; Stunkard & Messick, 1985; Van Strien, Frijters, Bergers, & Defares, 1986; Wardle et al., 2001). These have the advantage of being cheap and convenient to administer on a large scale. They also integrate behaviours over many situations (e.g., Do you eat more when you: smell good food, see others eating, pass a cake shop, etc.), some of which may be strong exemplars of the latent behavioural trait and others 'fuzzy' exemplars. Respondents can understand that the questions relate to 'usual' behaviour and therefore are not sidetracked by individual deviant instances. But self-reports of behaviour are necessarily subjective, raising questions about whether they are reliable and valid indicators of the latent trait. Psychometric measures are particularly problematic in children who may lack the comprehension skills and self-awareness required to answer questions about their behaviour. The usual substitute is parent-report, which may promote socially desirable responses, and has the disadvantage of constituting a second-hand account of child behaviour based only on eating occasions that the parent is able to observe. However, parents have privileged observational access to their children and hence are in a strong position to contribute to the assessment of behavioural traits.

Validation of psychometric measures of eating behaviour is typically limited to a combination of face validity (the questions make sense in relation to the construct), internal validity (the items are inter-correlated), test–retest reliability (there is stability of response over several test occasions) or concurrent validity (scores are correlated with scores on a related measure) (Caccialanza et al., 2004; Laessle, Tuschl, Kotthaus, & Pirke, 1989; Van Strien et al., 1986; Wardle et al., 2001). A small number of studies extend to 'criterion group' validation but this usually involves clinical groups (e.g., normal weight vs. obese; Braet & Van Strien, 1997), and for some constructs (e.g., food cue responsiveness), the association with weight status is a substantive scientific question rather than proof that the questionnaire measures the trait it is supposed to measure.

Few studies have examined correlations between scores on a psychometric scale and measures of eating behaviour in the laboratory as a validation strategy. Jacobi, Agras, Bryson, and Hammer (2003) examined the relationship between a range of behavioural measures and parental reports of pickiness, but pickiness was operationalised as a dichotomous rather than a continuous variable. Similarly, Van Strien (1997) found a positive association between overeating after a preload and a psychometric measure of susceptibility to failure of restraint, but susceptibility was defined with a two-group classification. Part of the problem with correlational analyses for validation, is that it is unclear how large a correlation between the questionnaire score and the behaviour would be needed to support the argument that the scale is a valid measure of the trait. Behaviour in the laboratory is just one instance of the trait, measured on one occasion. The correlation is therefore likely to be modest. Even correlations between related, objectively measured behavioural variables have been found to be low (Epstein, 1981). If behavioural consistency is limited, then associations between behaviour and a psychometric measure of the trait are likely to be even lower.

Epstein (1983) makes a strong argument for the value of aggregation in behavioural measures, both over time to cancel out the un-representativeness of a person's behaviour on a particular occasion, and over modes and methods of measurement to cancel out the unique characteristics of the particular measurement procedure. He argues that, as the number of behaviour measures increases—both across situations and time—their cumulative association with the psychometric measure should also increase. Demonstrating in a linear regression analysis that successive inclusion of more behavioural measures increases the strength of the association with the trait measure suggests that the behavioural measures each explain some independent part of the variance in the psychometric measure. As the psychometric measure is designed to assess variance on a latent trait, the behavioural tests may therefore tap independent aspects of this latent trait.

The Child Eating Behaviour Questionnaire (CEBQ; Wardle et al., 2001) is a multi-dimensional, parent-report questionnaire measuring children's eating behaviour. It was designed to capture individual differences in aspects of eating style that have been hypothesised to contribute both to underweight and overweight. The constructs in the scale were derived from the literature on eating behaviour and weight, the meaningfulness of items was confirmed in qualitative work with parents, and the test was shown to have high internal validity and test–retest reliability (Wardle et al., 2001). The present study focuses on behavioural validation of three sub-scales: Satiety Responsiveness/Slowness in Eating, Food Responsiveness and Enjoyment of Food.

The Satiety Responsiveness/Slowness in Eating (SR) scale includes four items assessing satiety sensitivity, that is, the degree to which an individual ceases eating or chooses not to initiate eating based on their perceived fullness (e.g., My child gets full before his/her meal is finished). Responsiveness to satiety has been hypothesised to be low in obese individuals (Schachter, 1968), leading them to fail to regulate their energy intake and consequently to overeat. In support of this, Johnson and Birch (1994) tested