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Associations between appetitive traits and food preferences in preschool children ☆

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ABSTRACT

Background: The ways in which children eat, their appetitive traits, are associated with their food intakes and weight status yet it is unclear whether they also relate to food preferences.
Methods: A cross-sectional self-report survey administered in two Australian cities. Food preferences were grouped according to the Australian Guide to Healthy Eating and a summary measure of healthiness, the Healthy Preference Index, was constructed. Bi-variate and multiple linear analyses examined relationships between each of the CEBQ dimensions and between the CEBQ dimensions and children's food preferences ($P < 0.05$).
Results: In total, 371 parents of children aged 2–5 years (response rate 53.5%) participated. The models explained approximately 32% of the variance in children's Healthy Preference Index scores and 42% of the variance in preferences for vegetables. CEBQ dimensions *Fussiness*, *Enjoyment of Food* and *Food Responsiveness* were significant predictors of several of the food preference measures in linear regression analyses. *Fussiness* predicted all of the measures of food preferences, explaining a large proportion of the variance in such measures (ranging from 23% to 59%). *Enjoyment of Food* predicted greater liking of Vegetables and Meats as well as a higher Variety Index score. *Food Responsiveness* was associated with greater preferences for non-core Extra Foods, and reduced preferences for Vegetables. None of the other CEBQ dimensions meaningfully associated with children's food preferences.
Conclusions: Of the eight CEBQ subscales, children's *Fussiness*, *Enjoyment of Food* and *Food Responsiveness* predicted food preferences. Some, but not all, of the CEBQ subscales appear to be meaningful predictors of children's food preferences.

1. Introduction

Given the high prevalence of overweight and obesity (Australian Bureau of Statistics, 2014; de Onis, Blössner, & Borghi, 2010; Ogden, Carroll, Kit, & Flegal, 2012; Olds, Tomkinson, Ferrar, & Maher, 2010) and patterns of poor food intakes in young children (Commonwealth Scientific Industrial Research Organisation & University of South Australia, 2007; Cowin, Emmett, & A. s. t., 2000; Siega-Riz et al., 2010) investigation of the factors that affect children's food intakes is a public health priority. To improve the efficacy of interventions targeting children's eating, which have been only moderately successful to date, (Hung et al., 2015; Laws et al., 2014; Wake & Lycett, 2014) a comprehensive understanding of what affects children's diets is required. One important behavioral characteristic affecting children's eating and weight that has largely been overlooked in health interventions is appetitive traits: *how* a child eats.

Appetitive traits influence food intakes and weight by affecting when and where individuals eat, the initiation and termination of eating and the types and amounts of foods consumed. (Carnell & Wardle, 2009; French, Epstein, Jeffery, Blundell, & Wardle, 2012). Wardle and colleagues (Wardle, Guthrie, Sanderson, & Rapoport, 2001) developed the Children's Eating Behavior Questionnaire (CEBQ) as a means of quantitatively studying children's non-clinical appetitive traits. The CEBQ has eight dimensions representing food approach (i.e. *Enjoyment of Food*, *Emotional Overeating, Food Responsiveness*, *Desire to Drink*)

Abbreviations: CEBQ, Children's Eating Behaviour Questionnaire; AGHE, Australian Guide to Healthy Eating; SEIFA, Socio-Economic Indexes for Areas; SES, Socio-Economic Status; HPI, Healthy Preference Index.

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and food avoidance (i.e. *Satiety Responsiveness*, *Slowness in Eating, Emotional Undereating* and *Fussiness*) styles.

Appetitive traits are associated with children's dietary intakes (Cooke et al., 2004; Sweetman, Wardle, & Cooke, 2008) and eating patterns (Syrad, Johnson, Wardle, & Llewellyn, 2016). For instance, in 2–6 year old British children the *Enjoyment of Food* CEBQ subscale positively associated with fruit and vegetables intakes (Cooke et al., 2004), whilst in a study of older British children (mean age 11 years), the *Desire to Drink* CEBQ subscale was positively associated with higher intakes of soft drinks (Sweetman et al., 2008). Some CEBQ subscales are also associated with children's energy intakes and weight status (Carnell & Wardle, 2008; Parkinson, Drewett, Le Couteur, & Adamson, 2010; Spence, Carson, Casey, & Boule, 2011; Viana, Sinde, & Saxton, 2008; Webber, Hill, Saxton, Van Jaarsveld, & Wardle, 2008) even when controlling for possible confounders such as parental BMI and socio-economic disadvantage (Jansen et al., 2012), although there are exceptions (Powers, Chamberlin, van Schaick, Sherman, & Whitaker, 2006; Svensson et al., 2011). In one study, for instance lower *Satiety Responsiveness* and higher *Food Responsiveness* predicted children's higher weight status (Carnell & Wardle, 2008). Given the growing body of work now attesting to the importance of appetitive traits as predictors of children's weight and food intakes, it is relevant to understand further the mechanisms that may explain this.

Children's food preferences (i.e. food likes and dislikes) are one of the most significant influences on children's food intakes amongst available foods (Benton, 2004) and, importantly, they can be shifted to healthier patterns with public health intervention (Lowe, Horne, Tapper, Bowdery, & Egerton, 2004). The reasons why children's appetitive traits may associate with food preferences are twofold. Firstly, both children's appetitive traits and food preferences and may share a common genetic architecture {Fildes, van Jaarsveld, Cooke, Wardle, & Llewellyn, 2016 #1938; Dubois et al., 2013 #1672}. The second pathway is via children's food experiences. In particular, one avenue through which children's appetitive traits may affect their food experiences is via the influence they have on parents' feeding strategies. Children with higher food approach tendencies have parents who use more restriction and parents of children with higher food avoidance tendencies have parents who use more pressure in feeding (Jani, Mallan, & Daniels, 2015; Webber, Cooke, Hill, & Wardle, 2010). This is important because the ways in which parents feed children has effects on their food preferences. For example, pressuring children to consume foods can reduce subsequent liking for the pressured food while restriction increases preference {Johnson, 2016 #1986}.

There is recent evidence that children's appetitive traits are in fact related to particular patterns of food preferences: Fildes et al. (Fildes et al., 2015) examined links between CEBQ scores and children's preferences for fruits, vegetables and non-core foods and showed that several associations between the CEBQ dimensions and children's food preferences, although not always in expected directions. In that study, children's vegetable preferences were associated with higher *Enjoyment of Food* and lower *Satiety Responsiveness*, *Slowness in Eating* and *Food Fussiness*. Preferences for non-core foods were associated with *Food Responsiveness and Enjoyment of Food* and not the other CEBQ dimensions.

While this research indicates that children's appetitive traits can be associated with their food preferences, data on associations between the CEBQ dimensions and other aspects of children's food preferences (e.g. variety), and in other samples are needed to further explore and understand relationships between children's appetitive traits and patterns of food preferences. From a public health perspective, information on relationships between appetitive traits and food preferences would aid in the development of strategies to attempt to modify appetitive traits and/or how parents react to them. For example, it may be important to provide parents of children high in either food approach or food avoidance tendencies with tailored support and information on how to feed such children to promote the further development of healthy food preferences and intakes. The aim of the present study was therefore to provide evidence on associations between children's appetitive traits as measured by the CEBQ and patterns of food preferences in a group of pre-school aged children.

2. Methods

2.1. Participants

Parents of children aged 2–5 years were approached at various locations (e.g. preschools, child care centres, swim centres) in Melbourne (44.20%) and Adelaide (55.80%), Australia, to participate in the study. Parents were provided with a consent form, plain language letter and reply-paid envelope. In order to recruit a diverse sample, centres were selected in low, middle and high socio-economic areas which was achieved by ranking all of the suburbs in the two cities by the 1998 Socio-Economic Indexes for Areas (SEIFA) Index of Relative Socio-Economic Advantage/Disadvantage (a composite measure of incomes and workforce skills) (Australian Bureau of Statistics, 1998) before splitting them into quintiles. The researchers selected three suburbs from the bottom, middle, and top quintiles and contacted centres within these suburbs. One parent of each preschool-aged child completed the questionnaire.

2.2. Measures

A self-report questionnaire was utilized. As no validated measure of children's food preferences was available, the authors developed a list containing 176 food and drink items covering the range of foods consumed in Australia. Parents reported their child's liking for each item on 5-point Likert scales (anchored "dislikes extremely" and "likes extremely") with the additional options of "never tried" and "do not know". The questionnaire also included the CEBQ (Wardle et al., 2001) which assesses 35 items across eight appetitive trait dimensions. Examples of items are "my child enjoys eating" (*Enjoyment of Food*), "my child eats more when anxious" (*Emotional Overeating*), "my child's always asking for food" (*Food Responsiveness*), "if given the chance, my child would always be having a drink" (*Desire to Drink*), "my child has a big appetite" (*Satiety Responsiveness*), "my child eats slowly" (*Slowness in Eating),* "my child eats less when s/he is upset" (*Emotional Undereating*), "my child enjoys tasting new foods" (*Fussiness*).

The CEBQ dimensions have good internal consistency, test-retest reliability and stability over time (Wardle et al., 2001). They have been validated against behavioral tests of eating behaviors (Ashcroft, Semmler, Carnell, van Jaarsveld, & Wardle, 2008; Farrow & Coulthard, 2012; Wardle et al., 2001) and their psychometric properties are sound (Carnell & Wardle, 2007) (Ashcroft et al., 2008; Carnell & Wardle, 2007; Wardle et al., 2001) though limited (Mallan, Daniels, & de Jersey, 2014) in various populations. The CEBQ has, however, been validated in an Australian population (Mallan et al., 2013). Respondents indicated how often their child typically carried out each of the behaviors on a 5-point Likert scale (anchored: never – always) with the addition of a "do not know" category. Demographic items included the parent's education, their child's sex and age.

2.3. Procedure

The questionnaire was pilot tested twice on a convenience sample of 28 parents of 2–5 year old children. Parents completed a