



Validation of the Children's Eating Behaviour Questionnaire in a low-income preschool-aged sample in the United States



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ABSTRACT

The Children's Eating Behaviour Questionnaire (CEBQ; Wardle, Guthrie, Sanderson, & Rapoport, 2001) is a widely used measure of child eating behaviors. Yet, only one study has examined the factor structure of the CEBQ among low-income children. In the current study, we examined the internal consistency, factor structure, and validity of the CEBQ among 1002 low-income preschool-age children recruited from Head Start locations in the United States. Confirmatory Factor Analysis indicated the CEBQ evidenced a reasonable fit to the data. Results also indicate that CEBQ subscales demonstrate good internal reliability (α 's $\geq .70$) and validity, with 7 of the 8 subscales associated with children's BMI z-scores in the expected directions. Equivalent factor loadings and indicator means across White and Black non-Hispanic participants were found, supporting measurement invariance between these two groups. In sum, our study supports the factor structure of the CEBQ among low-income preschool-aged children in the United States.

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1. Introduction

The Children's Eating Behaviour Questionnaire (CEBQ; Wardle et al., 2001) is one of the most widely used measures of eating behaviors in children. The CEBQ, which has been used in children age 2 years and older, originally yielded 8 subscales: Food Responsiveness, Enjoyment of Food, Emotional Overeating, Desire to Drink, Satiety Responsiveness, Slowness in Eating, Emotional Undereating, and Food Fussiness (Wardle et al., 2001). As described by Wardle and others (Carnell & Wardle, 2007; Wardle et al., 2001), the Food Responsiveness subscale consists of items assessing appetite and an inclination towards appealing external food cues (i.e., external eating). The Enjoyment of Food subscale also reflects a child's appetite and interest in eating. The Emotional Eating subscales tap into over- and under-eating in response to negative emotions (e.g., anger, sadness, anxiety, and boredom). A need for frequent beverage or drink consumption is assessed by Desire to

Drink items. The Satiety Responsiveness subscale consists of items indicating that a child attends to internal cues of fullness and stops eating based on such perceived fullness. The Slowness in Eating (sometimes combined with the Satiety Responsiveness subscale) consists of items that assess a child's speed of eating (e.g., taking a longer time to finish food or consume food). Finally, the Food Fussiness subscale consists of items reflecting a child being selective about foods eaten (e.g., picky eating or difficulty in pleasing a child with foods).

The CEBQ was originally developed and validated in the United Kingdom among White primarily middle-income samples (Ashcroft, Semmler, Carnell, van Jaarsveld, & Wardle, 2007; Carnell & Wardle, 2007; Wardle et al., 2001; Webber, Hill, Saxton, Van Jaarsveld, & Wardle, 2009). In translated versions of the CEBQ in middle-income and/or well-educated samples in other Western and non-Western countries, the internal reliability and validity of the CEBQ subscales has also generally been supported (Mallan et al., 2013; Sleddens, Kremers, & Thijs, 2008; Svensson et al., 2011; Viana, Sinde, & Saxton, 2008). In three ethnically diverse samples in Australia (e.g., first-time mothers; immigrant Indian mothers; and immigrant Chinese mothers), Mallan and colleagues also found

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support for the factor structure and construct validity of the CEBQ. Yet, despite the prevalence of obesity in low-income children in the United States (US), only one study has examined the factor structure of the CEBQ in this population.

Sparks and Radnitz (2012) evaluated the factor structure of the CEBQ in a sample of 229 primary caregivers of children who were recruited from Head Start preschools. Sparks and Radnitz's sample was unique in that most caregivers were Hispanic and Black. These authors conducted a Confirmatory Factor Analysis (CFA) on this sample and found that the original CEBQ factor structure did not replicate. The subscales of the CEBQ also did not significantly correlate with BMI, suggesting poor validity. Using exploratory factor analysis (EFA), these authors proposed an alternate 3-factor structure for the CEBQ to capture eating behaviors of racially/ethnically diverse samples of low-income children. This 3-factor structure consisted of 15 items contributing to the factors Disinhibition, Food Interest, and Undereating.

There are certain aspects of Sparks and Radnitz's study that could account for the poor fit of the original CEBQ to the data. First, the CEBQ was administered to participants in both Spanish and English, although the article did not specify the number of participants given the CEBQ in each language. Second, the CFA was conducted on only 34 of the 35 original items. Finally, the study had a small sample size of participants with complete data ($n = 179$). Addressing these limitations and evaluating the alternate 3-factor model in a new sample is needed to determine the factor structure of the original (or modified) CEBQ in low-income United States preschool-age populations.

The current study examines the factor structure and validity of the original 8-factor, as well as the 3-factor, CEBQ in a large sample of 1002 low-income preschool-age children in the United States. We hypothesized that the original factor structure will replicate in this sample given prior robust support for the CEBQ across diverse samples (e.g., Mallan et al., 2013). Finally, we explored measurement invariance of the CEBQ in White and Black non-Hispanic participants (i.e., the two racial/ethnic groups largely represented in the sample).

2. Materials and method

2.1. Participants

Primary caregivers and children were recruited from Head Start locations in South Central Michigan for participation in two large studies. Head Start is a free, federally-funded preschool program for low-income children. The first study examined stress and eating in low-income preschoolers ("Appetite, Behavior, and Cortisol [ABC]" Cohort; see Lumeng et al., 2014 for more details) and the second was an intervention study, with the CEBQ administered pre- and post-intervention ("Growing Healthy" cohort, see Miller et al., 2012 for a detailed description). The first administration of the CEBQ and corresponding BMI were used in the analyses for all participants.

Recruitment procedures and exclusion and inclusion criteria were nearly identical between the two studies. Families were told about the studies during Head Start classroom open houses and through flyers sent home in children's backpacks. For the ABC cohort, potential participants were told that the study was focused on "stress and eating in preschoolers." In order to participate in this study, children must have been aged 3–4 years at study enrollment and all caregivers were required to have less than a 4-year college degree. Exclusion criteria included that the child had developmental disabilities that would preclude participation, food allergies or significant medical problems that

affected appetite or eating, or was in foster care; or that the caregiver was non-English speaking. For the Growing Healthy cohort, potential participants were told that the study was about "children's development, behavior and growth." This study had the same inclusion and exclusion criteria as the first study with two exceptions. First, no restriction was placed on educational attainment for the primary caregiver. Although this was not an exclusion criterion, few participants had a Bachelor's degree or higher ($n = 16$; see description of participants in Results section) in the Growing Healthy cohort. Second, presence of child food allergies was not an exclusion criterion in the Growing Healthy cohort. Both studies were approved by the University of Michigan Medical School Institutional Review Board; written informed consent was provided by the child's legal guardian (most often, the biological mother). Participants received compensation for participation.

2.2. Procedures

Identical procedures were followed in the administration of the Child Eating Behaviour Questionnaire (CEBQ) and assessment of child body mass index (BMI) in both studies (see below). Questionnaires were administered orally by trained research assistants to the primary caregivers, to account for low literacy within the participating population. The oral administration of the CEBQ took place in participants' homes or, if preferred by the participant, in private rooms in community locations (e.g., local Head Starts or community health agencies). The research assistants did not provide any additional clarification on the items. Research assistants were trained to repeat the item verbatim if the study participant requested clarification. During the measure administration, participants could view the CEBQ response options on a reference card. Caregiver height and weight measurements were taken in the home or in a community location (e.g., Head Start). For child BMI, research assistants obtained height and weight measurements in Head Start classrooms.

2.3. Measures

2.3.1. Demographic characteristics

Several demographic variables were assessed at the time of the CEBQ administration. For the child, demographic characteristics obtained were: sex, age, and race/ethnicity. Caregiver characteristics that were assessed included: relationship of caregiver to child, caregiver level of education, and race/ethnicity of primary caregiver.

2.3.2. Children's Eating Behaviour Questionnaire

As described in the Introduction, the CEBQ is a 35-item, caregiver-report questionnaire, consisting of the following subscales (with sample items): Food Responsiveness ("Given the choice, my child would eat most of the time"), Enjoyment of Food ("My child loves food"), Emotional Overeating ("My child eats more when worried"), Desire to Drink ("My child is always asking for a drink"), Satiety Responsiveness ("My child gets full before his/her meal is finished"), Slowness in Eating ("My child takes more than 30 min to finish a meal"), Emotional Undereating ("My child eats less when she/he is upset"), and Food Fussiness ("My child refuses new foods at first"). Participants rated child eating behaviors on a 5-point Likert scale ranging from never (1) to always (5), with higher ratings indicating greater endorsement of the given eating behavior. Subscales are calculated as means of the contributing items, with indicated items reverse-scored (see Fig. 1 and Appendix for items). Items were identical to the original scale (Wardle et al.,

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