



Research report

Vegetable parenting practices scale. Item response modeling analyses [☆]

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ABSTRACT

Objective: To evaluate the psychometric properties of a vegetable parenting practices scale using multidimensional polytomous item response modeling which enables assessing item fit to latent variables and the distributional characteristics of the items in comparison to the respondents. We also tested for differences in the ways item function (called differential item functioning) across child's gender, ethnicity, age, and household income groups. **Method:** Parents of 3–5 year old children completed a self-reported vegetable parenting practices scale online. Vegetable parenting practices consisted of 14 effective vegetable parenting practices and 12 ineffective vegetable parenting practices items, each with three subscales (responsiveness, structure, and control). Multidimensional polytomous item response modeling was conducted separately on effective vegetable parenting practices and ineffective vegetable parenting practices. **Results:** One effective vegetable parenting practice item did not fit the model well in the full sample or across demographic groups, and another was a misfit in differential item functioning analyses across child's gender. Significant differential item functioning was detected across children's age and ethnicity groups, and more among effective vegetable parenting practices than ineffective vegetable parenting practices items. Wright maps showed items only covered parts of the latent trait distribution. The harder- and easier-to-respond ends of the construct were not covered by items for effective vegetable parenting practices and ineffective vegetable parenting practices, respectively. **Conclusions:** Several effective vegetable parenting practices and ineffective vegetable parenting practices scale items functioned differently on the basis of child's demographic characteristics; therefore, researchers should use these vegetable parenting practices scales with caution. Item response modeling should be incorporated in analyses of parenting practice questionnaires to better assess differences across demographic characteristics.

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Introduction

High dietary intake of fruit and vegetables has been associated with reduced risk of cardiovascular disease, stroke, diabetes, and some cancers (Boeing et al., 2012) and possibly obesity in adults (Ledoux, Hingle, & Baranowski, 2011). Diet behaviors are learned at young ages, continue throughout the childhood years (Kelder, Perry, Klepp, & Lytle, 1994) and carry into adulthood (Lien, Lytle, & Klepp, 2001; Lytle, Seifert, Greenstein, & McGovern, 2000; Savage, Fisher, & Birch, 2007). Parents can influence young children's food preferences (Birch, 2006; Faith, 2005; Faith, Scanlon, Birch, Francis,

& Sherry, 2004; Spruijt-Metz, Lindquist, Birch, Fisher, & Goran, 2002). Parenting practices, i.e., parents' behaviors to influence their child's behaviors, were related to young children's vegetable consumption (O'Connor, Watson et al., 2010).

What parents do to influence their child's vegetable intake could be effective or ineffective at achieving the intended goal (O'Connor, Hughes et al., 2010). The effective vegetable parenting practices scale with three theoretically proposed subfactors was designed to identify parenting practices which are likely to contribute to a preschooler's long-term vegetable intake, and ineffective vegetable parenting practices also with three theory specified subfactors either not influencing, or adversely influencing, a preschool child's long-term vegetable intake. While scales measuring effective and ineffective vegetable parenting practices have been developed and evaluated via classical test theory approaches (Baranowski et al., 2013), no psychometric analyses have been reported using item response modeling. Compared to classical test theory which is sample-dependent, item response modeling provides model-based measurements, and has several advantages, including trait level and

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item estimates as a function of participants' responses to administered items (Hambleton & Swaminathan, 1985; Hambleton, Swaminathan, & Rogers, 1991). For example, the participant's estimated trait level of vegetable parenting practices depends both on a person's response to these items and the items' parameters.

Since the introduction of Bock's nominal model (Bock, 1972), polytomous item response modeling (i.e., for items with multiple response categories) has been viewed as a means for improving psychological measurement. In comparison to dichotomous response (e.g., yes/no) models, polytomous models allow more information about trait level to be extracted from a fixed set of items (Bock, 1972; Drasgow, Levine, Williams, McLaughlin, & Candell, 1989; Lee, Moreno, & Sympson, 1986; Sympson, 1983; D. Thissen & Steinberg, 1984; D. M. Thissen, 1976); provide increased rates of detection of aberrant response patterns (Drasgow, Levine, & McLaughlin, 1987, 1991); and provide specific feedback to item writers about which response options are effective to measure respondents' latent trait.

Valid measures are critical to exploring how parents employ parenting practices to influence children's behavior and to evaluate factors moderating parenting practices' effects. Previous studies showed that parenting practices and the interpretation of a parenting practice questionnaire differed by demographics such as age, gender, ethnicity, and parental socioeconomic status (Bradley, Corwyn, McAdoo, & Coll, 2001; Chen et al., 2013). Differences in the interpretation or use of feeding parenting practices have also been reported (Anderson, Hughes, Fisher, & Nicklas, 2005; Loth, MacLehose, Fulkerson, Crow, & Neumark-Sztainer, 2013). For example, the Child Feeding Questionnaire (Birch et al., 2001) was found to have a different factor structure based on the ethnicity of the parent completing the questionnaire (Anderson et al., 2005). Children's psychological development is distinct by age (Gardner, 1978), thus parents may interact differently with children based on the child's age. It is therefore important to assess whether vegetable parenting practice items function differently on the basis of a child's age, gender, ethnicity, or parental socioeconomic status as well. The analysis that examines differences in item performance among subgroups is called differential item functioning. For example, items in a TV parenting practices scale showed differential item functioning on the basis of parental education, parental language, and child age (Chen et al., 2013). Without assessing such differences, comparing the parameter estimates from different samples may be misleading. Multidimensional polytomous item response modeling incorporates differential item functioning analysis to assess possible different item performances among subgroups (Bolt & Stout, 1996). This study specifically assessed differences in subgroup performance at the item level, i.e., whenever participants from different subgroups have the same amount of the underlying trait measured by the scale but may perform unequally on an item. Since items deal with specific parenting practices (behaviors), there may be differences across demographic categories at the item level. The present study investigated the item and person characteristics of vegetable parenting practices scales using multidimensional polytomous item response modeling, and identified items that may function differentially across a child's gender, ethnic group, household income, and age.

Methods

General design

The study design and methods have been reported in detail elsewhere (Baranowski et al., 2013). All measures were collected using a web-based survey from October 2010 to February 2011 (Survey Monkey, 2010). Briefly, parents reported vegetable parenting practices and demographic information including children's gender, age, ethnicity, and income. The Institutional Review Board of the Baylor

College of Medicine approved the study protocol, and participants provided informed consent.

Participants

Parents with a preschool-aged child were recruited through the Children's Nutrition Research Center newsletter; fliers throughout the Texas Medical Center, public libraries, and YMCAs in Houston; personal emails to previous Children's Nutrition Research Center volunteers; and a posting on the Baylor College of Medicine volunteer website. The eligibility criteria included (1) being a parent of a preschooler (3–5 years old), (2) being able to read and write in English, and (3) having the child spend most of their time with a caregiver. In addition, the authors assumed that (1) if a respondent had more than one child, he/she chose one child and answered questions accordingly and (2) multiple respondents did not answer separate surveys for the same child. IP, email, and home addresses were examined for duplicates; if there were duplicates, the first set of responses was kept and subsequent entries removed. Of 406 parents who initiated the questionnaire, 307 parents were included in the study after deleting participants with incomplete or duplicated data, participants who did not have a 3 to 5 year old child, or whose child did not spend most days with that parent or guardian.

Instrument

The survey scale contained 28 items, with 14 items each for effective vegetable parenting practices and ineffective vegetable parenting practices. All items featured three response options: *Always*, *Sometimes*, and *Never*. The items were conceptualized across three hypothesized dimensions (responsiveness, structure, and control) of food parenting (S. O. Hughes, O'Connor, & Power, 2008). Therefore, there are six subscales in total with three subscales for each effective and ineffective practice. Responsiveness is "the extent to which parents foster individuality and self-assertion by being attuned, supportive, and acquiescent to children's requests; it includes warmth, autonomy support, and reasoned communication" (Baumrind, 2005) (e.g., "I tell my child that vegetables taste good"). Structure, within a parenting context, is creating an environment for children that supports the desired behavior and highlighting associations between actions and consequences through availability, accessibility, expectations, and rules provided by parents (Grolnick, Deci, & Ryan, 1997) (e.g., "I give my child vegetables for their snacks"). Control is parents' attempt to direct children's behavior by punitive and restrictive methods, with an emphasis on psychological control and demeaning remarks (Grolnick & Pomerantz, 2009) (e.g., "I make my child feel guilty when they don't eat their vegetables").

Effective vegetable parenting practices should boost children's enjoyment of and actual vegetable consumption beyond the short term (O'Connor, Watson et al., 2010). While ineffective vegetable parenting practices might obtain a child's immediate compliance with eating more vegetables, the result would not become part of a child's long term eating habits (O'Connor, Hughes et al., 2010). Professional judgments were used to provide guidance for dividing the items into categories identified as effective and ineffective (O'Connor, Hughes et al., 2010). All scales were re-coded so that higher scores reflected higher levels of a given construct.

Values of Cronbach's alpha ranged between 0.46 and 0.63, and each of the six subscales contained roughly equal numbers of items (Table 2). Multiple approaches were used to determine the factor structure of 31 effective and ineffective vegetable parenting practices used by parents of preschool children. In addition to Cronbach's alpha, corrected item-total correlation (for scales with few items) and confirmatory factor analyses were also used to assess the structure of the vegetable parenting practices. The corrected item-subscale total correlations were all above 0.20, and the data fit the

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