



## Picky eating and fruit and vegetable consumption in college students

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### ABSTRACT

Picky eating (PE) may be an important individual-level factor related to fruit and vegetable (F&V) consumption in adulthood. Past studies showing negative relationships between Adult PE and F&V servings and variety have been limited by measurement issues. The purpose of the present study was to replicate these relationships in college students using a well-validated F&V screener and comprehensive measure of adult PE. 1219 college students completed an online survey which included measures of adult PE, F&V daily servings, F&V variety, and other eating behaviors. Partial correlations were calculated, controlling for demographic factors and traditional disordered eating behavior, between the variables of interest. Factor analysis was also utilized to confirm the factor structure of the Adult Picky Eating Questionnaire (APEQ) in a college sample. Partial correlations revealed significant negative relationships between PE and measures of F&V servings and variety. Factor analysis confirmed the utility of the APEQ in a college sample. College students who reported higher levels of PE behaviors and attitudes were more likely to eat less fruits and vegetables, and reported lower F&V variety. Given that F&V servings and variety are related to adequate nutrient intake, and greater F&V consumption is a protective factor against chronic disease risk, the rigid inflexible eating patterns associated with adult PE should be further explored in future research aimed at increasing F&V consumption.

### 1. Introduction

Fruit and vegetable (F&V) consumption in the United States remains stagnant, despite public health interventions to reduce dietary behaviors that impact chronic disease risk (Guenther, Dodd, Reedy, & Krebs-Smith, 2006). College students exhibit especially low adherence to national dietary guidelines (Huang et al., 2003), suggesting that emergent adulthood is an important developmental period during which adult eating behaviors can be influenced (Lowry et al., 2000).

Picky eating or selective eating (PE) is characterized by the consumption of a limited variety of food, through the avoidance or rejection of a large proportion of both familiar (i.e. foods common to an individual's food environment) and unfamiliar foods (i.e. foods the individual has never been exposed to; Taylor, Wernimont, Northstone, & Emmett, 2015). PE can include the rejection of foods based on novelty (i.e. food neophobia) or specific textures and tastes (e.g. bitter, sour, slimy; Dovey, Staples, Gibson, & Halford, 2008). It has been negatively associated with F&V consumption and dietary diversity in children and adults (Dovey et al., 2008; Taylor et al., 2015; Zickgraf & Schepps, 2016). PE may be an important individual-level factor to consider in efforts to increase F&V consumption, considering that 35% of adult

community sample participants report some degree of pickiness (Ellis, Galloway, Webb, & Martz, 2016; Kauer, Pelchat, Rozin, & Zickgraf, 2015). Furthermore, severe levels of adult PE may lead to the weight, nutrition, or psychosocial consequences that cause an individual to meet criteria for Avoidant/Restrictive Food Intake Disorder (ARFID; American Psychiatric Association, 2013; Ellis et al., 2016; Thomas et al., 2017; Wildes, Zucker, & Marcus, 2012; Zickgraf, Franklin, & Rozin, 2016).

Adult PE was recently linked to lower daily servings of F&V and lower F&V variety (Zickgraf & Schepps, 2016); however, the authors did not use a validated measure to estimate daily F&V servings and the assessment of PE was limited to a single item. The purpose of this study was to examine relations between adult PE and F&V consumption using a validated F&V screener and a multidimensional measure of adult PE (Ellis et al., 2016). It was hypothesized that individuals who scored higher on PE would report lower daily servings and lower variety of F&V. To support the utility and consistency of the Adult Picky Eating Questionnaire (APEQ), the factor structure of the APEQ was tested in a large college student sample, and it was hypothesized that the APEQ would be strongly, and positively, correlated with other measures of PE behaviors and attitudes.

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## 2. Materials and methods

A sample of 1536 college students enrolled in introductory psychology courses at a large state university in the Southeastern United States volunteered to complete an online survey for course credit. Students are required to earn credit (an approximate 5-hour time commitment) in their introductory psychology course through some type of research-based enrichment experience. This can include participating in a research study (chosen by most students) or choosing to read and answer questions about research articles. Students were informed that the purpose of the study was to increase understanding of college student eating and health, and provided informed consent at the start of the survey. The university's Institutional Review Board approved the study's procedure. Participants who failed embedded validity checks were excluded ( $n = 317$ ), resulting in a final sample of 1219. The sample included 972 (63.3%) women, 548 (35.7%) men; one participant identified as transgender and two as "other." Race/ethnicity distribution was predominantly Non-Hispanic White [1143 (74.4%) Non-Hispanic White, 224 (14.6%) Black, 33 (2.1%) Asian, and 94 (6.1%) participants endorsed being of Hispanic or Latino origin]. The mean age of the sample was 18.57 ( $SD = 1.52$ ).

### 2.1. Measures

Participants self-reported general demographic information, height, and weight. Body mass index BMI was calculated from these self-reported measures. Participants estimated family income by responding to 12-point Likert scale ranging from "1 = \$0–\$9,999" to 12 = "Greater than \$150,000".

#### 2.1.1. Adult picky eating

Participants completed the 16-item Adult Picky Eating Questionnaire (APEQ; Ellis et al., 2016), a multidimensional measure of adult picky eating attitudes/behaviors. The APEQ provides a total score and four subscales: Meal Presentation (rigid food preparation and presentation preferences); Food Variety, (limited food variety and avoidance of novel foods); Meal Disengagement (avoidance of meal-times); and Taste Aversion (rejection of bitter and sour tasting foods). The APEQ is scored on a 5-pt Likert scale from "Never (1)" to "Always (5)", and items are averaged for the total score and subscales. Higher scores represent greater PE.

The Food Neophobia Scale (Pliner & Hobden, 1992), and the Inflexibility Index (Zickgraf et al., 2016), were also used to assess aspects of PE to provide further construct validity for the APEQ. Food neophobia is an important element or subform of PE, and refers to the general reluctance to eat, or avoidance, of novel or unknown foods (Dovey et al., 2008). The Inflexibility Index assesses rigid eating behaviors (e.g., refusal of familiar foods based on presentation or preparation; Zickgraf et al., 2016). Each measure showed good internal consistency in the present study ( $\alpha_{\text{Neophobia}} = 0.84$ ;  $\alpha_{\text{Inflexibility}} = 0.85$ ).

#### 2.1.2. Fruit and vegetable consumption

The National Cancer Institute (NCI) Fruit and Vegetable All-Day screener (Thompson et al., 2002) was administered to assess average daily intake of fruit and vegetable servings. The screener asks about 10 categories of fruits and vegetables (e.g., fruit, lettuce salad, vegetable soups). Participants reported daily consumption frequency (from "never" to "5 or more times per day"), and estimated their usual serving sizes within each of the 10 categories. The screener provides valid estimates of median F&V intake (Thompson et al., 2002).

To assess food variety, participants reported their consumption of 33 common vegetables and 22 common fruits. Scores were calculated for the percentage of foods from each group they ate at least occasionally (see Zickgraf & Schepps, 2016, for a full description of the food variety measure). The scale is based on other measures of dietary variety, and associations between fruit and vegetable variety and daily

servings in the current sample ( $\rho_{\text{Fruit}} = 0.23$ ,  $p < .001$ ;  $\rho_{\text{veg}} = 0.25$ ,  $p < .001$ ) were similar to previous correlations observed between variety and F&V intake (McCrorey et al., 1999).

#### 2.1.3. Eating disorder symptoms

The Eating Disorder Diagnostic Scale (EDDS; Stice, Telch, & Rizvi, 2000) was used to assess disordered eating behaviors and symptoms. The standardized symptom composite score was calculated to assess symptom severity (Stice & Ragan, 2002). The EDDS composite score demonstrated excellent internal consistency in this sample ( $\alpha = 0.89$ ).

### 2.2. Data analysis

A Confirmatory Factor Analysis (CFA) procedure using a robust maximum likelihood (MLR) estimator was employed to test the fit of the APEQ in a college sample. Data were analyzed using the lavaan package in R (R Core Team, 2015; Rosseel, 2012). A second-order factor model using a fixed factor measurement scale, which included the 16-items, four APEQ subscales, and a general factor, was estimated. Criteria for good model fit were determined by the Comparative Fit Index (CFI), and the root mean square residual (RMSEA). Cutoffs for acceptable fit were evaluated based on Hu and Bentler's (1999) recommendations. Full Information Maximum Likelihood was used to account for missing data (Graham & Coffman, 2012). Internal consistency estimates for the APEQ scales were calculated using omega ( $\omega$ ) statistics within the second-order model.

Descriptive statistics and Pearson's product moment partial correlations were calculated to examine the relationships between the APEQ total score and subscales and the following: F&V consumption, the Food Neophobia Scale, and the Inflexibility Index. Because they were count variables, non-parametric Spearman partial correlations were calculated between F&V servings and variety, and APEQ scales/self-reported BMI. Given that there was insufficient power to examine each ethnic-racial minority group separately, race/ethnicity was recoded as a dichotomous variable, Caucasian ( $n = 941$ ), and Ethnic-Racial Minority ( $n = 271$ ). Although inconsistent across some studies, past research has related higher PE to male participants (Cardona Cano et al., 2015; Ellis et al., 2018; Tharner et al., 2014), lower socioeconomic status (SES; Tharner et al., 2014), and non-Western backgrounds (Cardona Cano et al., 2015; Tharner et al., 2014). Research has also demonstrated that while PE is distinct from other disordered eating presentations, they can be comorbid, leading to greater impairment (Wildes et al., 2012). Thus, sex, race/ethnicity, the EDDS standardized composite score, and self-reported family-income were included as covariates in all analyses to control for demographic factors and traditional eating disorder symptomatology.

## 3. Results

See Table 1 for descriptive statistics of study variables. Median estimated family income was in the "\$80,000–\$89,999" range. Most of the participants were in their freshman year (76.3%), and the demographic composition of the sample reflected that of the university's population (East Carolina University, 2016). CFA indicated adequate model fit,  $\chi^2(100) = 345.37$ ,  $p < .001$ , CFI = 0.93, RMSEA = 0.05 (90% CI = 0.04–0.05). Items loaded strongly on the domain factors (0.43–0.76), and each domain factor loaded well on to the general PE factor (Meal Presentation = 0.82; Food Variety = 0.87; Meal Disengagement = 0.47; Taste Aversion = 0.76). The general factor and all domain factors, except for the Taste Aversion subscale, showed adequate internal consistency (see Table 2).

Overall, students reported low daily fruit and vegetable consumption (mean = 2.26, median = 2.00), with approximately half of the sample eating two or fewer servings per day. Partial correlations showed significant negative correlations between the APEQ Composite score and daily servings of F&V, and variety of F&V intake (see Table 2).

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