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What does a person's eating identity add to environmental influences on fruit and vegetable intake?

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ABSTRACT

Objective: To evaluate whether knowledge of a person's eating identity (EI) can explain any additional variation in fruit and vegetable intake above and beyond that explained by food environment characteristics, perceptions of the food environment, and shopping behaviors.
Design: Cross-sectional study.
Setting: A total of 968 adults were recruited for a telephone survey by the Survey Research Laboratory in an eight-county region in South Carolina.
Subjects: The survey queried information on shopping behaviors, perceptions of the food environment, demographic and address information, fruit and vegetable intake, and EI. EI was assessed using the Eating Identity Type Inventory, a 12-item instrument that differentiates four eating identity types: healthy, emotional, meat, and picky. Statistical analyses were restricted to 819 participants with complete data.
Results: Healthy EI and picky EI were significantly and directly related to fruit and vegetable intake, with coefficients of 0.31 (p-value<0.001) for healthy EI and −0.16 (p-value<0.001) for picky EI, whereas emotional EI ($\beta = 0.00$, p-value = 0.905) and meat EI ($\beta = -0.04$, p-value = 0.258) showed no association. Shopping frequency also directly and significantly influenced fruit and vegetable intake ($\beta = 0.13$, p-value = 0.033). With the inclusion of EI, 16.3% of the variation in fruit and vegetable intake was explained.
Conclusions: Perceptions and GIS-based measures of environmental factors alone do not explain a substantial amount of variation in fruit and vegetable intake. EI, especially healthy EI and picky EI, is an important, independent predictor of fruit and vegetable intake and contributes significantly to explaining the variation in fruit and vegetable intake.

1. Introduction

Fruit and vegetable intake has many health benefits (Slavin & Lloyd, 2012). Given that current national consumption patterns fall markedly short of recommendations (Dietary Guidelines Advisory Committee, 2015; Kirkpatrick, Dodd, Reedy, & Krebs-Smith, 2012), health promotion programs have targeted psychosocial characteristics, behaviors, and environmental attributes to increase fruit and vegetable intake. In the past decade, the residential food environment has received increasing attention as one attribute of the built environment that may contribute to poor dietary choices (Aggarwal et al., 2014; Bodor, Rose, Farley, Swalm, & Scott, 2008; Michimi & Wimberly, 2010; Moore, Diez Roux, Nettleton, & Jacobs, 2008; Morland, Wing, & Diez Roux, 2002; Rose & Richards, 2004). Our research group has shown previously that the food environment influences fruit and vegetable intake among household food shoppers in a study of eight counties in South Carolina, although this effect is not direct but instead acts indirectly through food shopping behaviors (Liese et al., 2014). Moreover, despite extensive information on food environments, shopping behaviors, and perceptions of the food environment, we

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were able to explain only 3% of the variation in fruit and vegetable intake (Liese et al., 2014). However, previous studies by our group and others have shown that psychological aspects are also important in explaining fruit and vegetable intake (Bisogni, Connors, Devine, & Sobal, 2002; Blake, Bell, Freedman, Colabianchi, & Liese, 2013; Devine, Sobal, Bisogni, & Connors, 1999).

Eating identity (EI) is a psychosocial determinant of diet that helps explain the motivators of food choice behaviors (Abrams & Hogg, 1999; Allom & Mullan, 2012; Bisogni et al., 2002; Kendzierski & Costello, 2004b; Strachan & Brawley, 2009; Blake et al., 2013; Harmon, Blake, Armstead, & Hebert, 2013). It is now recognized that multiple types of EIs exist that influence dietary and food choice behaviors (Bisogni et al., 2002; Blake & Bisogni, 2003; Devine et al., 1999; Jabs, Sobal, & Devine, 2000). Indeed, we reported previously that EI, which was developed to assess affinity with four specific eating behavior types (healthy, meat, picky, and emotional), is associated with dietary intake (Blake et al., 2013). Multiple studies have demonstrated that people who describe themselves as healthy eaters have healthy diets and are more receptive to nutrition education messages (Bisogni et al., 2002; Devine, Connors, Bisogni, & Sobal, 1998; Devine et al., 1999; Kendzierski, 2007; Kendzierski & Costello, 2004a; Strachan and Brawley, 2009). In our previous study, higher healthy EI scores were associated with higher intakes of fruits and vegetables and grams of fiber and a lower percentage of total kilocalories from fat, whereas higher picky and meat-eating EI scores were associated with less-healthy dietary intake. It is likely that EI also influences how people perceive and interact with their food environments.

Kremers et al. showed preliminary evidence that environmental factors may have an impact on health behaviors (energy balance–related behaviors), likely via a mediated path through individual-level factors, i.e., motivation and ability (Kremers et al., 2006). A healthy food environment that offers plenty of options may increase motivation to consume healthy foods. However, studies focusing on the mediating and moderating effects of potential motivational and environmental determinants are largely lacking (Brug, 2008). Thus, the purpose of the present study is to evaluate whether knowledge of a person's EI can explain any additional variation in fruit and vegetable intake above and beyond that explained by the previously identified food environment characteristics, perceptions of the food environment, and shopping behaviors.

2. Methods

Detailed survey procedures and methods of the study have been described previously (Liese et al., 2014). A total of 968 adults were recruited for a telephone survey by the Survey Research Laboratory in an eight-county region in South Carolina. The survey queried information on shopping behaviors (name and address of the store in which respondents conducted the majority of their grocery shopping and the frequency of shopping at that store), perceptions of the food environment (Echeverria, Diez Roux, & Link, 2004; Mujahid, Diez Roux, Morenoff, & Raghunathan, 2007; Moore, Diez Roux, Nettleton et al., 2008; Moore, Diez Roux, & Brines, 2008; Moore, Diez Roux, Nettleton, Jacobs, & Franco, 2009), demographic and address information, fruit and vegetable intake (Thompson et al., 2004, 2005), and EI (Bisogni et al., 2002; Blake and Bisogni, 2003; Blake, Jones, Pringle-Washington, & Ellison, 2010; Caplan, 2013; Devine et al., 1999; Kendzierski and Costello, 2004a). EI was assessed using the Eating Identity Type Inventory (EITI) (Blake et al., 2013), a 12-item instrument that differentiates four eating identity types: healthy, emotional, meat, and picky. Meat EI was included in the current study of fruit and vegetable intake because our initial study showed an inverse association between meat EI and fruit and vegetable intake. The initial study demonstrated the validity and reliability of the EITI (Blake et al., 2013). Additionally, we utilized validated data on the retail food environment of the entire study region (Liese et al., 2010). Detailed descriptions of these variables can be found in papers by Liese et al (Liese et al., 2010; Liese et al., 2014). and Blake et al. (Blake et al., 2013).

Our statistical analyses were restricted to 819 participants with complete data after listwise deletion of missing geospatial data, fruit and vegetable intake, perceptions, shopping behaviors, and EI information. Because the distributions of shopping frequency and distance to primary store were skewed, these variables were Winsorized at the 95th percentile. The relationships between a) GIS-based measures of supermarket availability, b) perceptions of the availability of healthy foods in the neighborhood and ease of shopping access, c) shopping behaviors (distance and frequency), d) EI, and e) fruit and vegetable intake were examined through path analysis using PROC CALIS in SAS v9.4. Because the perceptions variables are theoretically related to one another, as are the two shopping behavior variables, the reciprocal nature of these two sets of variables was reflected in the model using double arrows (Fig. 1). We report standardized beta coefficients and p-values for paths and explained variation for endogenous variables in a simplified version, focusing on the statistically significant associations only (p-value<0.05) in Fig. 2. Unlike regression models, a single path analysis model (similar to structural equation modeling) tests a theoretical model that is believed to be applicable to a general population comprised of persons of differing ages, race/ethnic groups, marital status, and genders. In other words, if we believed that the conceptual model we developed would not apply equally to women and men; we would evaluate the fit of the model for each gender separately. The same rationale would apply to any other covariates. Thus, a path analysis model does not control for factors that are considered confounders in regression analysis because it would result in over specification of the model (Hermstad, Swan, Kegler, Barnette, & Glanz, 2010).

3. Results

Characteristics of the study sample are presented in Table 1. The mean age of the study sample was 57 years; 33% of the participants were minorities (African American, Hispanic, or other); and 80% were female. The average self-reported fruit and vegetable intake was 4.5 servings per day. The mean emotional, healthy, meat, and picky EITI scores (standard deviation) were 2.5 (0.9), 3.7 (0.8), 3.1 (1.0), and 2.5 (0.9), respectively, with a possible range of 1–5.

Fig. 2 shows a simplified representation of the full path analytic results, containing only the statistically significant paths. Healthy EI and picky EI were significantly and directly related to fruit and vegetable intake, with coefficients of 0.31 (p-value<0.001) for healthy EI and −0.16 (p-value<0.001) for picky EI, whereas emotional EI ($\beta = 0.00$, p-value = 0.905) and meat EI ($\beta = -0.04$, p-value = 0.258) showed no association. However, emotional EI and meat EI were significantly associated with participants' perceptions of ease of shopping access, with coefficients of −0.07 (p-value = 0.046) for emotional EI and 0.07 (p-value = 0.041) for meat EI. Meat EI was indirectly associated with fruit and vegetable intake via shopping frequency (path from meat EI to shopping frequency: $\beta = 0.08$, p-value = 0.020). Shopping frequency also directly and significantly influenced fruit and vegetable intake. No other direct influences on fruit and vegetable intake were observed in the path model. In totality, with the inclusion of EI, all variables in the path analysis explained 16.3% of variation in fruit and vegetable intake.