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Research report

Ecological momentary assessment of environmental and personal factors and snack food intake in African American women ☆

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ABSTRACT

This study examined contributions of environmental and personal factors (specifically, food availability and expense, daily hassles, self-efficacy, positive and negative affect) to within-person and between-person variations in snack food intake in 100 African American women. Participants were signaled at random five times daily for seven days to complete a survey on a study-provided smartphone. Women reported consuming snack foods at 35.2% of signals. Easier food availability accounting for one's usual level was associated with higher snack food intake. Being near outlets that predominately sell snacks (e.g., convenience stores), while accounting for one's usual proximity to them, was associated with higher snack food intake. Accounting for one's usual daily hassle level, we found that on days with more frequent daily hassles snack food intake was higher. The positive association between within-person daily hassles frequency and snack food intake was stronger when foods were easily available. Public and private policies to curb ubiquitous food availability and mobile health interventions that take into account time-varying influences on food choices and provide real-time assistance in dealing with easy food availability and coping with stressors may be beneficial in improving African American women's day to day food choices.

Introduction

High intakes of energy, added sugars, and solid fats are of concern due to their association with obesity development, displacement of micronutrients, and chronic disease risk (Livingstone & Rennie, 2009; Wang, Steffen, Zhou, Harnack, & Luepker, 2013). Added sugars and solid fats now comprise 35% of U.S. adults' daily energy intake, even though guidelines from the World Health Organization (WHO) and the U.S. Department of Agriculture (USDA) suggest consumption be limited to no more than 15% (Krebs-Smith, Guenther, Subar, Kirkpatrick, & Dodd, 2010; U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2010; World Health Organization, 2003). Studies based on national data suggest that African American women in the Unites States have higher intake of added sugars and solid fats as compared to white women (Kirkpatrick, Dodd, Reedy, & Krebs-Smith, 2012; Thompson et al., 2009) and experience an excess burden of obesity and related chronic health conditions (Flegal, Carroll, Kit, & Ogden, 2012; Jemal et al., 2008; Ma et al., 2012; Shai et al., 2006). In fact, the prevalence of obesity is higher in African American women compared to white women at every level of income, and the inverse association between income and obesity may be weaker in African American women as compared to white women (Freedman, Grafova, & Rogowski, 2011). Top sources of energy, added sugars, and solid fats are snack-type foods including grain-based desserts (e.g., cookies, cake), dairy desserts (e.g., ice cream), candy, and salty snacks (e.g., chips, crackers) (Applied Research Program, National Cancer Institute, 2014; Bachman, Reedy, Subar, & Krebs-Smith, 2008; Chun, Chung, Wang, Padgitt, & Song, 2010; Huth, Fulgoni, Keast, Park, & Auestad, 2013). Better understanding the circumstances of African American women's lives that contribute to increased consumption of snack-type foods could help develop effective intervention approaches.

Decisions throughout the day determine dietary intake, including snack food consumption. Most correlational research on diet exclusively focuses on identifying factors that contribute to between-person differences, and little is known about within-person, time-varying influences on dietary intake (Dunton & Atienza, 2009). According

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to reciprocal determinism from social cognitive theory, the dynamic interplay of environmental and personal (e.g., cognitive, affective) factors influence health behaviors (McAlister, Perry, & Parcel, 2008). Such factors that fluctuate on a momentary basis (i.e., within-day or daily) may contribute to intra-individual variations in dietary intake.

In terms of environmental factors, both the food environment and social environment may influence dietary intake throughout the day. Research shows that living in a neighborhood with greater availability of unhealthy foods as measured directly by food products for sale or indirectly by outlet type (e.g., convenience stores and fast food outlets that predominately sell energy-dense, nutrient poor foods and beverages) is associated with snack food intake and higher body weight (Hickson et al., 2011; Reitzel et al., 2014; Rose et al., 2009; Zenk et al., 2013). Yet, few studies take into account changes in the food environment throughout the day based on where individuals conduct day-to-day activities such as work, school, social network members' homes, place of worship, and home (Kestens et al., 2012; Moore et al., 2013; Thornton, Lamb, & Ball, 2013; Zenk et al., 2011). In a sample of predominately white women (n = 39), one study using ecological momentary assessment (EMA) found that overeating was positively associated with the number of palatable foods available among those with a relatively high body mass index (BMI) (Thomas, Doshi, Crosby, & Lowe, 2011). While African American women are more likely to live in neighborhoods with a greater number of convenience or "corner" stores and fast food outlets (Morland, Wing, Diez Roux, & Poole, 2002; Powell, Auld, Chaloupka, O'Malley, & Johnston, 2007), little is known about their food exposures throughout the day and their impacts on dietary choices.

As a component of the social environment, greater exposure to daily hassles, or relatively minor events or irritants that arise out of daily life (Kanner, Coyne, Schaefer, & Lazarus, 1981; O'Connor, Jones, Conner, McMillan, & Ferguson, 2008), may contribute to higher snack food intake. Consumption of snack foods, which are often high in fat, sugar, or salt, may alleviate stress by activating the endogenous opioid (reward) system, reducing the hypothalamic-pituitary-adrenal (HPA) axis stress response, or providing sensory pleasure, distraction, or escape (Adam & Epel, 2007; Gibson, 2012). African American women are exposed to more stressors, and some have proposed that intake of foods high in fat, sugar, or salt may be an accessible and inexpensive coping response to stressful life circumstances (Jackson, Knight, & Rafferty, 2010; Zenk et al., 2013).

At the personal level, self-efficacy (confidence in one's ability to perform a particular behavior) (McAlister et al., 2008) and affect (conscious feeling or mood that can be good or bad) (Kanning, Ebner-Priemer, & Schlicht, 2013) are two factors that may play a role in momentary dietary choices. Self-efficacy is a well-established cognitive factor that contributes to between-individual differences in dietary behaviors and mediates intervention effects on dietary change (Shaikh, Yaroch, Nebeling, Yeh, & Resnicow, 2008; Thomson, Zoellner, & Tussing-Humphreys, 2014; Watters, Satia, & Galanko, 2007). However, less is known about the extent to which self-efficacy varies on a momentary basis to affect within-individual dietary decisions throughout the day. Considerable research has focused on contributions of negative affect (e.g., feelings such as being afraid or nervous) to dietary choices, including snack food intake, with some studies showing that negative affect is associated with greater consumption of these foods (Fay & Finlayson, 2011; Ford, Jaceldo-Siegl, Lee, Youngberg, & Tonstad, 2013). The association between positive affect (e.g., feelings such as being excited or inspired) and dietary choices is the subject of less research. Yet, positive affect may contribute to eating by, for example, increasing hedonic pleasure, providing justification to indulge, and via an associative learning mechanism by which positive emotions become tied to eating (Evers, Adriaanse, de Ridder, & de Witt Huberts, 2013). Research suggests that positive affect may have a stronger impact than negative affect on unhealthy food choices (Bongers, Jansen, Havermans, Roefs, & Nederkoorn, 2013; Evers et al., 2013; White, Horwath, & Conner, 2013). To our knowledge, however, contributions of within daily and daily fluctuations in self-efficacy and affect to dietary intakes have generally not been studied in African American women.

Consistent with reciprocal determinism, it is possible that associations among environmental factors, personal factors, and dietary choices are interactive and dynamic. Daily hassles or affect may have a larger effect on snack food intake in environments where these food items are easily available or inexpensive than in environments in which these options are less physically and economically accessible (Diez Roux & Mair, 2010; Loxton, Dawe, & Cahill, 2011; Zenk et al., 2013). Dietary intake may also impact personal factors later in the day (Hendy, 2012; Macht, Gerer, & Ellgring, 2003; White et al., 2013). Specifically, consuming snack foods may erode self-efficacy to avoid these foods, diminish positive affect, or contribute to negative affect.

Using ecological momentary assessment (EMA), the purpose of this study was to examine contributions of fluctuations in environmental and personal factors (specifically, perceived food availability and expense, daily hassles, self-efficacy, positive and negative affect) to within-person and between-person variations in snack food intake in African American women. The hypotheses, focused on within-person associations, were: (1) Greater food availability and lower expense (e.g., availability of retail sources including convenience store, restaurant, bakery, or candy store; inexpensive foods) are associated with a greater (concurrent) likelihood of snack food intake; (2) Higher levels of daily hassles, negative affect, and positive affect, as well as lower self-efficacy, are associated with greater likelihood of snack food intake concurrently (at the same EMA signal, or during the same time period) and subsequently (at the next EMA signal several hours later); (3) Greater food availability and lower expense exacerbate positive associations of both daily hassles and (positive and negative) affect with snack food intake; and (4) Snack food intake contributes to subsequent lower positive affect, greater negative affect, and decreased self-efficacy (at the next EMA signal). Between-person associations between environmental and personal factors and snack food intake are also reported.

Methods

Sample

Our recruitment goal was a socioeconomically diverse sample of African American women aged 25 to 65 living in metropolitan Chicago, Illinois. It is important to understand dietary correlates in African American women of varying SES given that the likelihood of obesity and poor diet tend to be similar across all levels of individual SES in this group (Freedman et al., 2011). Exclusion criteria were self-reported inability to read and write English and full-time student status. Of the women who enrolled (n=102), 101 completed the study and one dropped out. Some women (n = 20) were recruited from a focus group study on daily hassles; the remainder (n = 82) were recruited through fliers and email announcements at a public university and fliers and in-person invitations at community sites (e.g., community centers, health fairs). One woman did not complete any EMA surveys; therefore, the sample for this analysis is 100.

Measures

Snack food intake

Snack food intake was the primary dependent variable. At each signal, intake of nine categories of snack and non-snack food and beverages since the last signal was assessed. Intake of snack foods was measured based on five of these categories: cookies or sweetened baked goods (e.g., cake, donut), chocolate or candy, ice cream or frozen dessert, salty snacks (e.g., potato chips), and French fries or other fried side dish. These categories were adapted from the Dietary Screener Questionnaire (National Health Interview Survey, 2014) based on focus groups