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Relationships between Energy Balance Knowledge and the Home Environment

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ABSTRACT

Certain aspects of the home environment as well as individuals' knowledge of energy balance are believed to be important correlates of various dietary and physical activity behaviors, but no known studies have examined potential relationships between these correlates. This study evaluated cross-sectional associations between characteristics of the home environment and energy balance knowledge among 349 youth/parent pairs recruited from the Minneapolis/St Paul, MN, metropolitan area from September 2006 to June 2007. Linear regression models adjusted for student grade and highest level of parental education were used to compare data from home food, physical activity, and media inventories (parent-reported) with energy balance knowledge scores from youth and parent questionnaires. Paired energy balance knowledge (average of youth and parent knowledge scores) was associated with all home food availability variables. Paired knowledge was also significantly associated with a media equipment availability and accessibility summary score ($\beta=-1.40$, $P=0.005$), as well as an activity-to-media ratio score ($\beta=0.72$, $P=0.003$). Youth and/or parent knowledge alone was not significantly associated with most characteristics of the home environment, supporting the importance of developing intervention strategies that target the family as a whole.

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The high prevalence of obesity is a major public health concern (1). Although the causes of this nationwide epidemic are not clear, obesity is generally attributed to a variety of genetic, behavioral, social, and environmental factors leading to chronic energy imbalance. Recently, there has been interest in the home environment and how it can influence dietary, physical activity, and sedentary behaviors. For example, consumption of fruits and vegetables, as well as soft drinks and less-healthful snacks, by children and adolescents has been correlated with home availability of these foods (2-9). Similarly, the presence of physical activity equipment in the home has been associated with behavior in the form of higher levels of physical activity in adults (10-12) and female college students (13), although results for children have been mixed (14-19). Home media environments (eg, number of televisions in the home) also have been positively correlated with television viewing among children (20,21).

Despite these associations, it remains unclear which psychological, personal, social, and demographic factors have the greatest impact on the home environment. Individuals' energy balance knowledge is one such factor with potential to influence the nature of the home environment, although little research has explored this issue. Substantial positive associations have been found between greater nutrition knowledge and more-healthful eating and/or food-purchasing behaviors among adolescents (22), college students (23), and adults (24-28), but the evidence is not consistent across all studies (3,27,29). Physical activity knowledge has not been consistently linked to favorable physical activity behaviors (30,31). This lack of consistency may be explained by the notion that knowledge is just one of many elements that influence behavior. For example, behavioral skills, role models, reinforcements, and incentives are also believed to have an impact on children's behaviors (32).

According to the conceptual model (based on a social ecological framework) from the Transdisciplinary Research in Energetics and Cancer: The Identifying Determinants of Eating and Activity (TREC IDEA) study, knowledge and various other factors are believed to influence the home environment (33). All of these variables then are believed to influence behavior. Although increased energy balance knowledge alone may not result in behavior change, it may be an important aspect of the behavior change process. Nelson and colleagues (34) noted that relatively low energy balance knowledge scores among parents and youth were not substantial predictors of weight-related outcomes. However, the authors suggested educational strategies may be effective

when combined with other strategies targeting familial, social, and environmental factors.

To date, no known studies have examined possible relationships between energy balance knowledge and the home food, physical activity, and media environments. Therefore, the purpose of this study was to evaluate the associations between energy balance knowledge and the home environment among youth, parents, and overall family units (including both youth and parents). It was hypothesized that greater energy balance knowledge would be positively associated with the availability and/or accessibility of healthful food and physical activity equipment in the home and negatively associated with the availability and/or accessibility of less-healthful food and media equipment when controlling for education level.

METHODS

This study was a cross-sectional analysis of baseline data collected for the TREC IDEA study, a 3-year longitudinal etiologic study of the social and environmental influences on unhealthy weight gain in adolescence. From September 2006 to June 2007, 349 youth (ages 10 to 16 years) were recruited from within a seven-county metropolitan area of the Minneapolis/St Paul region of Minnesota and were required to participate with one adult (parent/guardian or other caregiver). Recruitment occurred through a preexisting cohort (35), a permit application listing from the Minnesota Department of Motor Vehicles, and a local convenience sample. At baseline, both the youths and the parents completed similar self-report questionnaires evaluating various energy balance behaviors and attitudes as well as their energy balance knowledge. Parents provided written consent, and youths provided written assent before completing questionnaires. Additional details about subject recruitment and data collection methods for the TREC IDEA study have been described elsewhere (33). Study procedures were approved by the University of Minnesota Institutional Review Board.

Energy Balance Knowledge

A 15-item scale was included in the youth and parent questionnaires to assess energy balance knowledge. Example questions included the following: "If someone sits all day, they do not need to eat any calories" (true or false); "How many calories does the average teenage boy need to consume every day?" (multiple choice). The questions were pretested among youth similar in age to the study sample and from the same geographic area. The energy balance knowledge scale was tested for internal consistency (Cronbach α was .56 among youth and .67 among parents), and has been described in detail elsewhere (34). To represent overall household knowledge, youth/parent scores were averaged to create a paired knowledge score.

Home Food Inventory

The Home Food Inventory was validated for face, criterion, and construct validity and is described in detail elsewhere (36). The final Home Food Inventory instrument included 208 food items in 13 major categories. Six variables assessed whether or not the item(s) were present anywhere in the home and included fruit, vegetables (not including french fries or hash brown potatoes), healthful snacks (whole-grain crackers, graham crackers, pretzels, and reduced-fat versions of the following: crackers, potato/tortilla/bagel chips, cheese curls/puffs, granola/sports bars), less-healthful snacks (corn chips, popcorn, peanuts, cashews, other nuts, and regular [not reduced-fat] versions of the following: crackers, potato/tortilla/bagel chips, cheese curls/puffs, granola/sports bars), healthful beverages (reduced-fat and nonfat milk, 100% fruit juice, water, soy/rice milk), and less-healthful beverages (regular soda, prepared iced teas or lemonade, fruit drinks, sport drinks). Higher scores represent greater availability. Of note, each item was assessed by its typical fat and sugar content (which are expected to directly impact the calorie content of the product) when determining its category as "healthful" or "less healthful." Given the focus on energy balance and obesity in this work, it is important to recognize that the designations of "healthful" and "less healthful" within the Home Food Inventory generally reflect the expected calorie content of the foods included, and do not necessarily reflect other dimensions of nutritional content (eg, micronutrient composition, extent of food processing, etc). Parents received the Home Food Inventory and were instructed to complete it at home and return by mail.

Physical Activity and Media Inventory

The self-report Physical Activity and Media Inventory was designed to comprehensively reflect the home availability and accessibility of physical activity and screen media equipment. The Physical Activity and Media Inventory was validated by Sirard and colleagues (37), and included 50 physical activity equipment items and 5 media equipment items (television, VCR/DVD, digital video recorder, video game system, and computer). Parents were instructed to look for items in all areas of their home, including storage areas, yards, and garages.

Physical Activity and Media Inventory household density scores were calculated separately for physical activity and media equipment by dividing the total number of items by the total number of rooms/locations in the home. Higher density scores indicate greater availability of equipment. Accessibility was determined by multiplying each item by an accessibility code, with 1=put away and difficult to get to and 4=in plain view and easy to get to. Two summary scores were created to account for availability and accessibility of the physical activity equipment (Physical Activity Availability and Accessibility Summary Score) and media equipment (Media Availability and Accessibility Summary Score). Higher summary scores reflect a greater overall presence in the home (both availability and accessibility). A third summary score, referred to as the Activity-to-Media Ratio Score was calculated as the ratio of the Physical Activity Availability and Accessibility Summary Score to the Media Availability and Accessibility Summary Score. A higher ratio indicated a home was more conducive for being physically active and less sedentary.