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Children's Intake of Fruit and Selected Energy-Dense Nutrient-Poor Foods Is Associated with Fathers' Intake

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ABSTRACT

Parental dietary intake, lifestyle behavior, and parenting style influence a child's weight status. Few studies have examined associations between parent–child dietary intake, or specific father–child associations. This cross-sectional study examined associations between father–child dietary intakes of fruit, vegetables, and selected energy-dense nutrient-poor foods. The study population consisted of overweight fathers with 50 father–child dyads included in the analysis; median (interquartile range) age of fathers was 39±8.0 years; body mass index was 32.7±5.3; and their primary school–aged children (n=50) (54% boys aged 8.5±3.0 years, body mass index *z* score 0.6±1.6) who had been targeted to participate in the Healthy Dads, Healthy Kids pilot trial in the Hunter region, New South Wales, Australia in 2008. Dietary intakes of fathers and children were assessed using validated food frequency questionnaires, with mothers reporting their child's food intake. Descriptive statistics were reported and Spearman's rank order correlations used to test the strength of associations between father–child intakes. Fathers' median (interquartile range) daily fruit and vegetable intakes were 0.9 (1.5) and 2.2 (1.3) servings/day, respectively, whereas children consumed 2.1 (2.4) fruit and 2.9 (2.1) vegetable servings/day. Moderately-strong positive correlations were found between father–child fruit intakes (r=0.40, P<0.01), cookies (r=0.54, P<0.001), and potato chips (r=0.33, P<0.05). There were no associations between intakes of vegetables, ice cream, chocolate, or french fries (P>0.05). Children's intakes of fruit and some energy-dense nutrient-poor foods but not vegetables were related to their father's intakes. The targeting of fathers should be tested in experimental studies as a potential strategy to improve child and family eating habits.

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Childhood overweight continues to increase worldwide (1), with adverse effects on physical, social, and psychological health (2) and increased risk of type 2 diabetes (3-5), cardiovascular disease (5-8), and mortality in adulthood (2,8,9). Overweight children with at least one overweight/obese parent have a 62% chance of remaining overweight during adulthood compared to 24% if neither parent was overweight/obese (10). The prevalence of overweight in children with overweight/obese parents almost doubles between ages 4 and 11 years compared to no change in those with lean parents (11).

Diet is an important contributor to energy imbalance and specific eating patterns are associated with weight status in children (12). Effective promotion of healthy eating in childhood is critical because eating habits established early in life track into adulthood (13,14). Research into the determinants of child dietary intake is increasingly focusing on environmental contributors (15), with the family environment recognized as important in shaping child eating behaviors (16).

A systematic review found parental dietary intake was consistently associated with children's fat, fruit, and vegetable intakes in 4- to 12-year-olds (17), although a more recent review suggested that parent–child intake has a moderate or weak association, with findings varying considerably across studies (18). However, none of the included studies examined fathers' intake as an individual determinant (17), highlighting that the relation between fathers' and their children's dietary intakes has rarely been studied. This omission needs to be addressed because parenting styles and behaviors of fathers, but not mothers, has been found to increase the odds of overweight in preschool children (19).

The purpose of this study was to determine whether, in overweight fathers participating in the Healthy Dads, Healthy Kids trial (20), an association exists between father–child dietary intakes. The hypothesis is that fathers with higher intakes of fruit, vegetables, or energy-

dense nutrient-poor foods will have children whose intakes of these food groups are also higher.

METHODS

Study Design

A cross-sectional analysis of baseline data from the Healthy Dads, Healthy Kids randomized controlled trial was conducted. Healthy Dads, Healthy Kids targeted overweight fathers to improve their own eating behaviors and physical activity to positively influence their children and is reported elsewhere (20). The Human Research Ethics Committee of the University of Newcastle, Callaghan, New South Wales, Australia, approved the study and fathers provided informed written consent, with child assent prior to participation.

Participants and Recruitment

The participants were 53 overweight fathers and their children (n=71), recruited into a weight management trial from the Hunter region, New South Wales, Australia, in 2008. Inclusion criteria were male, body mass index (BMI; calculated as kg/m^2) 25 to 40, aged 21 to 65 years with a child aged 5 to 12 years, access to Internet and e-mail, available to attend sessions, and willing to not participate in other weight loss programs during the study. Exclusion criteria included a history of major medical problems, diabetes, orthopedic or joint problems preventing physical activity, recent weight loss >4.5 kg, or taking medications affecting weight. For the purpose of this analysis, the sample size was limited to father–child dyads with complete data (n=50). Full methodologic details are published elsewhere (20).

Data Collection

Outcome measures were obtained from all participants at the University of Newcastle, except for the child's food frequency questionnaire (FFQ), which was completed by mothers in their home.

Anthropometric Measures

Two repeated measures of height from fathers and children were collected using the stretch stature method and a portable stadiometer (Harpenden [Holtain] Stadiometer, Mentone Educational Centre, Victoria, Australia) to 0.1 cm. Two repeated weight measures in light clothing, without shoes were taken using a calibrated scale to 0.1 kg (A&D Scales, Model CH-150KP, A&D Mercury Pty Ltd, Thebarton, South Australia). Two repeated measures of waist circumference were collected using nonextensible steel tapes and measured at the narrowest point. Average values were calculated and reported for height, weight, and waist circumference. BMI was calculated using the standard equation (weight [in kilograms]/height [in meters]^2). BMI z scores were calculated for the children using UK reference data (21,22).

Dietary Intake

Fathers' dietary intake was assessed using the Dietary Questionnaire for Epidemiological Studies version 2 FFQ from the Cancer Council of Victoria, which includes 74 items with 10 frequency responses assessing usual intake during the previous 12 months. Nutrient intakes were computed from the food composition database of Australian foods NUTTAB (Australian Government Publishing Service, 1995, Canberra, Australia) using software developed by the Cancer Council of Victoria.

To reduce potential reporting bias from fathers, each child's mother completed the Australian Child and Adolescent Eating Survey FFQ for them. The Australian Child and Adolescent Eating Survey is a 135-item semi-quantitative FFQ developed for use with Australian children and reports the frequency of child consumption during the previous 6 months (23). Its has been validated against multiple 24 hour dietary recalls (23) and against plasma carotenoid concentrations for parent-reported fruit and vegetable intake in 5- to 9-year-olds (24). Data from the Australian Child and Adolescent Eating Survey were scanned and nutrient intakes computed in FoodWorks (professional version 3.02.581, 2004, Xyris Software Pty Ltd, Brisbane, Australia) using the databases (Australian AusNut, All Foods, Revision 14 and AusFoods, Brands, Revision 5, 1999, Food Standards Australia New Zealand, Canberra, Australia) without modification.

Because the FFQs were developed for use in specific populations, not all questions were directly comparable and so fruits, vegetables, and similar energy-dense nutrient-poor items (eg, french fries, chocolate, potato chips, cookies, and ice cream) were selected a priori for comparison between father–child intakes. Servings for both father and child were defined as fruit 150 g, fruit juice 125 mL, and vegetables 75 g and aggregated to calculate daily total fruit and vegetable grams. Serving sizes for energy-dense nutrient-poor foods were determined according to Australian serving sizes (25). Complete dietary intake data were available for 50 father–child dyads.

STATISTICAL ANALYSIS

Descriptive statistics were calculated including median and interquartile range. Due to non-normal data distribution, Spearman's rank order correlation coefficients were used to investigate the relationship between father–child intakes of fruit, vegetables, energy-dense nutrient-poor items, macronutrients, percent energy from macronutrients, and selected micronutrients with separate analyses to explore the relationship between father–son and father–daughter fruit and vegetable intakes. Statistical analysis was undertaken using JMP (version 7, 2007, SAS Institute Inc, Cary, NC) with differences considered statistically significant at $P<0.05$.

RESULTS AND DISCUSSION

Father–child demographics and median (interquartile range) intakes of fruit, vegetables, macronutrients, and micronutrients and the energy-dense nutrient-poor food items are reported in Table 1. They were predominantly white and of moderate socioeconomic status (20).

Children's median daily intake of fruit and vegetables was higher, but servings of energy-dense nutrient-poor foods were lower, than that of fathers (Table 1). Half of children consumed ≥2 servings of fruit/day (excluding fruit juice) and more than one third consumed ≥4 servings of