Relationship of Dietary Factors and Physical Activity with Percent Body Fat in Young Children

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ABSTRACT

Methods used in this study were approved by the Institutional Review Boards at Texas Woman's University, the University of Arkansas for Medical Sciences (UAMS), and the University of Central Arkansas. Participants were recruited as a convenience sample carried out at the Arkansas Children's Nutrition Center (ACNC), one of six Human Nutrition Research Centers funded through the Agricultural Research Service. The ACNC is affiliated with Arkansas Children's Hospital, Arkansas Children's Hospital Research Institute and the University of Central Arkansas (UAMS).

Eighty-two children were recruited and 81 completed the study. Data from 3 children were eliminated because of erroneous lab results leaving 78 children (36 males and 42 females) for the final sample.

Inclusion criteria were:
- Age 3 to 5 years
- Full-term at birth (37+4 weeks gestation)
- Birth weight >3.5 pounds
- Child exclusively fed formula or breast milk during infancy >6 months
- English the primary language of the parent/guardian
- Parent/guardian was >18 years of age

Exclusion criteria were:
- Disorders affecting growth
- Chronic disease
- Disorders affecting carbohydrate metabolism
- Moderate to severe asthma or other pulmonary disorders
- Bone disease
- Attention-deficit/hyperactivity disorder or attention-deficit disorders
- Chronic use of medications that could impact bone density

METHODS: Participants and Recruitment

All statistical analyses were conducted using SPSS, version 15.0, statistical database software. Descriptive statistics, including means, were used to describe the study participants' characteristics including gender, age, feeding group and anthropometric variables. Mean standard deviations and ranges were used to describe the nutritional variables. Independent sample t-tests were conducted in the study to test the differences between %BF and the following independent variables: 1) total daily energy in kilocalories; 2) mean daily intake of total fat grams; 3) fruit juice in fluid ounces; and NPAQ scores. A power analysis indicated that a sample size of 65 was necessary to detect an effect size of 0.50 with power of 80% and alpha = 0.01, assuming a minimum significant correlation coefficient of 0.60. The strength of the relationship between %BF and Body Fat Index (BF%) was determined using Pearson's (r) correlation coefficients.

RESULTS

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kilocalories</td>
<td>All</td>
<td>1,333.2</td>
<td>323.7</td>
</tr>
<tr>
<td>Males</td>
<td>1,431.7</td>
<td>336.6</td>
<td>651.8 - 2,428.3</td>
</tr>
<tr>
<td>Females</td>
<td>1,248.7</td>
<td>290.2</td>
<td>651.8 - 1,869.9</td>
</tr>
<tr>
<td>All</td>
<td>47.4</td>
<td>14.1</td>
<td>20.9 - 69.1</td>
</tr>
<tr>
<td>Males</td>
<td>47.8</td>
<td>14.7</td>
<td>20.9 - 69.1</td>
</tr>
<tr>
<td>Females</td>
<td>47.0</td>
<td>13.8</td>
<td>24.2 - 82.1</td>
</tr>
<tr>
<td>NPAQ score</td>
<td>All</td>
<td>72.1</td>
<td>12.3</td>
</tr>
<tr>
<td>Males</td>
<td>75.8</td>
<td>11.0</td>
<td>53.0 - 133.0</td>
</tr>
<tr>
<td>Females</td>
<td>68.8</td>
<td>12.5</td>
<td>33.0 - 94.3</td>
</tr>
<tr>
<td>Fruit Juice (fz)</td>
<td>All</td>
<td>4.8</td>
<td>4.9</td>
</tr>
<tr>
<td>Males</td>
<td>5.8</td>
<td>5.0</td>
<td>1.0 - 17.8</td>
</tr>
</tbody>
</table>

Note. *NPAQ - Netherlands Physical Activity Questionnaire

The study was limited by several factors. The study participants were from a limited geographic region in Central Arkansas. In addition, the cross-sectional nature of the study made it necessary to rely on the recall of the parents for some of the data. Parents were asked to recall how their child was fed as an infant and some may not have recollected the information accurately. In addition, a questionnaire administrator one time was used to assess the child's physical activity level and directly observe the child's activity level during a 24-hour period. Reliance on study participants to provide dietary intake data always poses potential problems because intake may have been over- or underestimated. Numerous health benefits have been well-documented with regard to breastfeeding (AAP, 2005), but there is insufficient evidence at the present time to support a direct link between breastfeeding during infancy and adiposity in childhood.

SUMMARY AND CONCLUSIONS

The results of the study lend support to previous studies. Numerous health benefits have been well-documented with regard to breastfeeding (AAP, 2005), but there is insufficient evidence at the present time to support a direct link between breastfeeding during infancy and adiposity in childhood.

Some interesting correlations emerged from the study warranting further investigation. These include the moderate to strong correlations observed between NPAQ and body fat and juice intake in boys and girls. It is important to note that this is an important finding since excess sugar intake in a formula is a leading factor in weight gain. See Table 2 for a summary of the correlation analyses.

Two-way analysis of variance found the following: A significant main effect for gender, F(1, 74) = 17.432, p < .001.

These data show that there was a significant difference in %BF of the male and female participants. However, no differences were found in mean %BF of participants who were fed breast milk and those fed formula during infancy. See Table 1 and 2 for comparisons of mean %BF by gender and feeding group.

Note. All correlations coefficients are Pearson's Product Moment Correlations. *p<.05, **p<.01. *Fat intake was polytomized fat acids, *Kcal is total Kilocalories; *NPAQ = Netherlands Physical Activity Questionnaire.