Gender Differences in the Relationships Between Elementary-school Students' Weight Status and Measures of Screen-Time, Physical Activity, Fitness, and Diet

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Study Objectives

1) Examine relationships between rural children's weight status and health behaviors, including screen time, physical activity, cardiovascular fitness, and diet within a multivariate context.

   Rising rates of childhood obesity have prompted the need to understand the role of various behavioral risk factors. Although there is some contradictory evidence, in general:

   - sedentary activities are positively associated with childhood obesity;
   - higher levels of moderate to vigorous physical activity are related to lower rates of obesity;
   - cardiovascular fitness is also inversely related to childhood obesity;
   - healthier diets (those high in fruit and vegetable consumption and low in intake of fats and sweets) are associated with lower risk for obesity.

2) Differentiate passive forms (television/video watching) from active forms (videogame and computer use) of screen time when examining the relationship with rural children's weight status.

   Sedentary screen time may increase risk for obesity by:

   - lowering energy expenditures by displacing physical activity;
   - promoting increased caloric intake via snacking behavior;
   - increasing the likelihood for unhealthy eating patterns by exposing children to food commercials during television viewing.

3) Examine the effect of gender on relationships between rural children's weight status and health behaviors.

   Some findings suggest that relationships between weight status and health behaviors may be different in boys and girls. For example:

   - the relationship between sedentary screen time and increased obesity risk appears strongest in girls,
   - the association between physical activity and lowered obesity risk is generally more robust in boys.

Method

Hypotheses

- Risk for overweight and obesity is associated with unhealthier diets, greater time spent in sedentary screen time, lower levels of physical activity, and lower cardiovascular fitness levels.
- Passive sedentary screen time is a stronger predictor of overweight and obesity than active forms of sedentary screen time.
- The association between physical activity and risk for overweight and obesity is stronger in boys than girls.

Participants

- 306 third-grade students (166 boys and 140 girls), aged 8–9 years from the rural Midwestern US.

- 66% were of non-Hispanic, white race/ethnicity, 34% were of American Indian race/ethnicity

Measures

- *Diet*
  - *Fruits and Vegetables Consumption*
  - *Fat or Sugar Consumption*
  - *Food Consumption Questionnaire*
- *Sedentary Screen Time*
  - *Television/Video Viewing*
  - *Computer/Video Game Playing*
- *Physical Activity*
  - *Extracurricular Team Sports*.
  - *Other Organized Physical Activity*.
  - *Vigorous Physical Activity*
- *Cardiovascular Fitness*
  - Progressive Aerobic Cardiovascular Endurance Run (PACER)
- Body Mass Index (BMI) Percentiles

Data Analysis

Multinomial logistic regressions were conducted to predict weight categories overweight and obese using normal weight as the reference group. Two prediction models were derived based on gender and controlling for ethnicity. Predictors in all models included dietary measures, sedentary screen time measures, physical activity measures, and cardiovascular fitness.

Results

Table 1. Total Sample and Gender Subsamples Descriptive Data with Inferential Comparisons Between Boys and Girls

MEASURE	Sample (*N*=306)	Boys (*n*=166)	Girls (*n*=140)
Weight Status			
Normal	59.2%	62.0%	55.7%
Overweight	15.4%	12.0%	19.3%
Obese	25.5%	25.9%	25.0%
Other Organized Physical Activity[a]	41.1%	32%	50%
Vigorous Physical Activity	75.8%	74.1%	78.7%
Extracurricular Team Sports	1.51 (0.49)	1.60 (1.18)	1.40 (1.21)
Television/Video Viewing	2.36 (1.10)	2.38 (1.11)	2.34 (1.07)
Computer/Video Game Playing[b]	2.52 (1.29)	2.87 (1.39)	2.11 (1.03)
Fruits and Vegetables Consumption	3.37 (2.34)	3.37 (2.42)	3.37 (2.24)
Fat or Sugar Consumption	5.41 (3.67)	5.73 (4.02)	5.04 (3.21)
Food Consumption Questionnaire	6.23 (2.60)	6.04 (2.46)	6.45 (2.75)
Cardiovascular Fitness[c]	18.10 (9.26)	19.33 (10.41)	16.71 (7.50)

Note: [a] Boys statistically different from girls $p < .001$; [b] Boys statistically different from girls $p < .001$; [c] Boys statistically different from girls $p < .01$

Table 2. Predicting Overweight and Obesity: Odds Ratios for Statistically Significant Health Behaviors.

	Boys		Girls	
	Overweight	Obese	Overweight	Obese
Television/Video Viewing	2.24, *p*<.05	2.1, *p*<.05		1.69, *p*<.05
Computer/Video Game Playing	0.54, *p*<.05			
Cardiovascular Fitness		0.83, p<.001		0.82, p<.001

Conclusions

1) Overweight and obesity are very prevalent in young (8-9 years) rural Midwestern children.
    - 40% of children in our sample were overweight or obese. Rates of obesity were higher in our sample (25.5%) than in national data (NHANES: 2007-2008) for children aged 6-11 years (19.6%).

2) Cardiovascular fitness and screen time were the only significant predictors of weight status in analyses also examining diet, physical activity, and ethnicity.

    - *Predicting Obesity*
        - Lower levels of cardiovascular fitness were significantly associated with obesity in both boys and girls.
        - Passive, but not active, sedentary screen time (television/video viewing) was significantly associated with obesity in girls and boys.

    - *Predicting Overweight*
        - In girls, none of the health behaviors significantly predicted overweight status.
        - Overweight boys spent more time engaged in passive screen activities (television/video viewing) than normal weight boys.
        - Overweight boys spent less time engaged in active screen activities (videogame and computer use) than normal weight boys.

Implications for Public Health

1) Improving cardiovascular fitness is an important goal in our attempts to reduce childhood obesity.
2) Inactivity itself may not promote obesity, as much as other factors related to the context in which we watch television such as snacking and/or exposure to food advertising.