



Predictors of Preschool Children's Body Mass Index: Breastfeeding Duration, Child Eating Behaviors, and Parental Feeding Practices

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Background

Childhood obesity is a significant public health concern that can impact the quality of a child's life with effects continuing throughout adulthood (Must & Strauss, 1999; Neef et al., 2013).

Breastfeeding duration has been associated with child weight status (DiSantis, Hodges, & Fisher, 2013).

- Inverse dose-response association between breastfeeding duration and obesity (Harder et al., 2005; DiSantis, Hodges, & Fisher, 2013).
- Breastfeeding duration has been associated with child satiety at 18 to 24 months and with higher fruit and vegetable intake in preschool children (Brown & Lee, 2012; de Lauzon-Guillain et al., 2013)

Children's eating behaviors have been found to contribute to weight status and some may also be potential risk factors for childhood obesity (Llewellyn et al., 2008).

- Obese children have been found to have decreased satiety responsiveness and increased food responsiveness (Llewellyn et al., 2008; Moens & Braet, 2007; Webber et al., 2009).
- Satiety responsiveness refers to the internal feeling of fullness and sense of satisfaction after eating (Wardle et al., 2001).
- Food responsiveness refers to children's general appetite and desire to eat, as well as children's external response to food cues—sight, smell, taste (Jansen et al., 2003; Webber et al., 2009).

Parental feeding practices may influence child eating behaviors and dietary intake which can influence child weight status (Haszard et al., 2015).

- Highly controlling parental feeding practices have been negatively associated with children's ability to regulate intake in response to energy content of foods (Johnson & Birch, 1994).

Purpose of Current Study

To examine how breastfeeding duration, children's eating behaviors (satiety and food responsiveness), and parental feeding practices (environment and parental control) are related to body mass index (BMI) among low-income preschool-aged children.

Method

Sample

N = 224 primary caregivers (M age = 30 years) of preschoolers (M age = 50 months, SD = .55, 55% male) from 3 Midwestern preschools. Primary caregivers completed demographic information and questionnaires about breastfeeding practices, child eating behaviors and parental feeding practices.

Measures

- Child height, weight, and BMI were collected by the programs.
- Breastfeeding duration: number of months child was breastfed
- **Child Eating Behavior Questionnaire** (35 items, CEBQ; Wardle et al., 2001; Carnell & Wardle, 2007) developed to examine eating styles of children aged 3 to 8.
 - **Satiety Responsiveness Subscale:** internal feeling of fullness
 - 5 items, Chronbach's $\alpha = .74$
 - **Food Responsiveness Subscale:** response to external food cues
 - 5 items, Chronbach's $\alpha = .81$
- **Parental Feeding Style Questionnaire** (27 items, PFSQ; Wardle et al., 2002)
 - **Control over Eating Subscale:** controlling when/what child may eat
 - 10 items, Chronbach's $\alpha = .67$
- **Comprehensive Feeding Practices Questionnaire** (49 items, CFPQ; Musher-Eizenman & Holub, 2007).
 - **Environment Subscale:** healthy food availability
 - 4 items, Chronbach's $\alpha = .47$

Analysis and Results

Correlations: Pearson listwise correlations between study variables are listed in Table 1.

Results:

- Breastfeeding was correlated negatively with BMI percentile ($r = -.16, p < .05$), positively with satiety responsiveness ($r = .16, p < .05$), and negatively with food responsiveness ($r = -.15, p < .05$).
- Breastfeeding was positively correlated with environment ($r = .22, p < .01$).
- Ethnicity was positively correlated with BMI percentile ($r = .16, p < .05$).

Table 1
Correlations among child BMI, breastfeeding duration, Satiety Responsivity, Food Responsivity, Control over Eating, Environment, age-in-months, sex, ethnicity and primary caregiver education.

Variables	1	2	3	4	5	6	7	8	9	10
1. Child BMI Percentile	—									
2. Breastfeeding Duration	-.16*	—								
3. Satiety Responsivity	-.10	.16*	—							
4. Food Responsivity	.17**	-.15*	-.35**	—						
5. Environment	-.06	.22**	-.02	-.23**	—					
6. Control Over Eating	.13*	-.11	-.12*	-.09	.18**	—				
7. Age in Months	-.14*	.02	-.03	.05	.05	-.06	—			
8. Sex	-.12*	-.03	-.09	-.07	-.03	-.01	.02	—		
9. Ethnicity	.16*	.02	.05	-.12*	.11	-.16*	.00	-.00	—	
10. Primary Caregiver Education	-.02	.00	.05	.07	.05	.13*	-.05	-.07	-.33**	—

Note. * $p < .05$, one-tailed. ** $p < .01$, one-tailed*. Listwise N=203

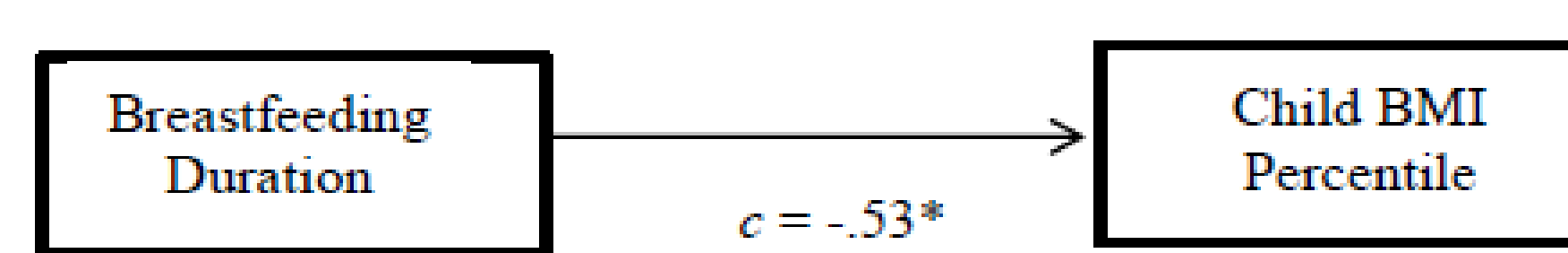
Mediation Analysis

- A series of simple mediation analyses were conducted using an ordinary least squares (OLS) regression-based path analysis.
- Analyses were used to estimate child eating behaviors and parental feeding practices influence from breastfeeding duration as well as BMI percentile from breastfeeding duration, child eating behaviors, and parental feeding practices (see Figures 1-4).
- Separate analyses were conducted for each of the four potential mediators: satiety responsiveness, food responsiveness, environment, and parental control over eating. Ethnicity was included as a covariate in every model.

Results

- Satiety responsiveness did not significantly predict BMI percentile ($b = -4.56, p = .12$).
- Food responsiveness significantly predicted BMI percentile when controlling for breastfeeding duration ($b = 6.44, p = .01$).
- Environment did not significantly predict BMI percentile ($b = -3.52, p = .40$).
- Parental control over eating significantly predicted BMI percentile ($b = 8.78, p = .03$).
- Breastfeeding duration continued to predict BMI percentile when controlling for satiety responsiveness ($c' = -.48, p = .04$), environment ($c' = -.50, p = .04$) and parental control ($c' = -.48, p = .04$).
- Breastfeeding did not significantly predict BMI percentile when food responsiveness was controlled. Confidence intervals for food responsiveness were -0.262 to -0.009 , providing evidence of an indirect effect of breastfeeding duration on BMI percentile through children's food responsiveness
- No other indirect effects were found.

a) direct path



b) mediate

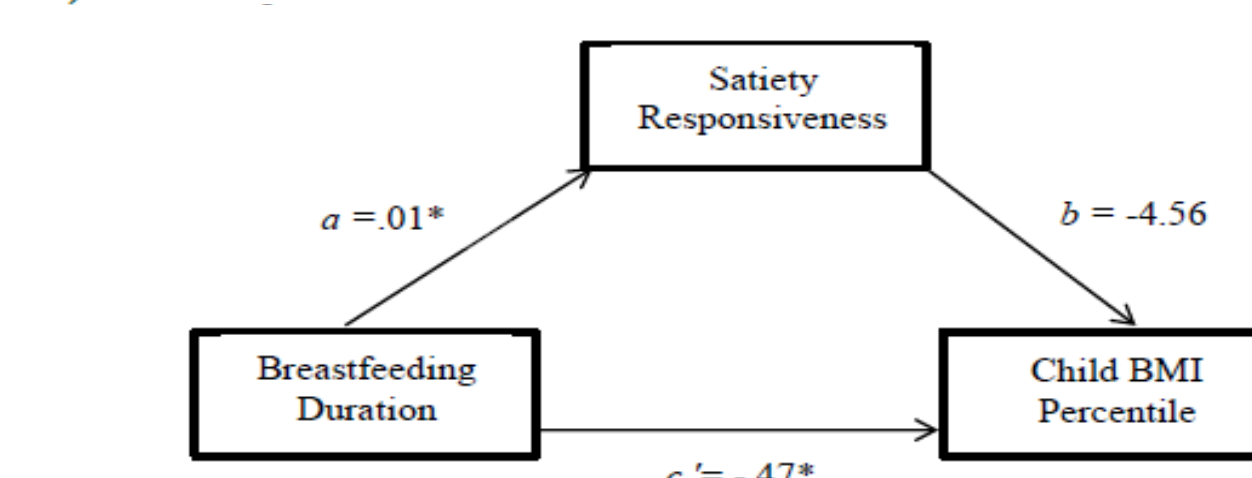


Figure 1. a) Unstandardized regression coefficient between breastfeeding duration and child BMI percentile. b) Unstandardized regression coefficients for the relationship between breastfeeding duration and child BMI percentile as mediated by Satiety Responsiveness. Note. * $p < .05$. Listwise N=205.

b) mediated path

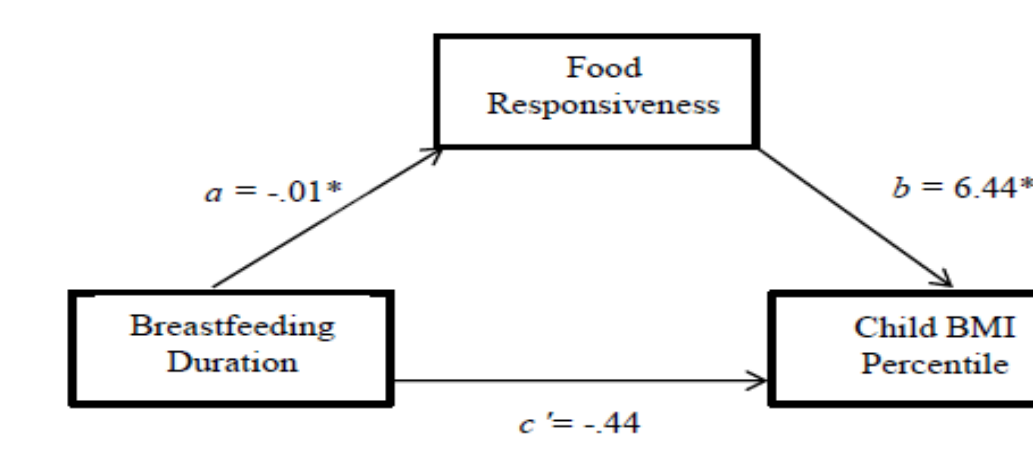


Figure 2. a) Unstandardized regression coefficient between breastfeeding duration and child BMI percentile. b) Unstandardized regression coefficients for the relationship between breastfeeding duration and child BMI percentile as mediated by Food Responsiveness. Note. * $p < .05$, ** $p < .01$. Listwise N=205.

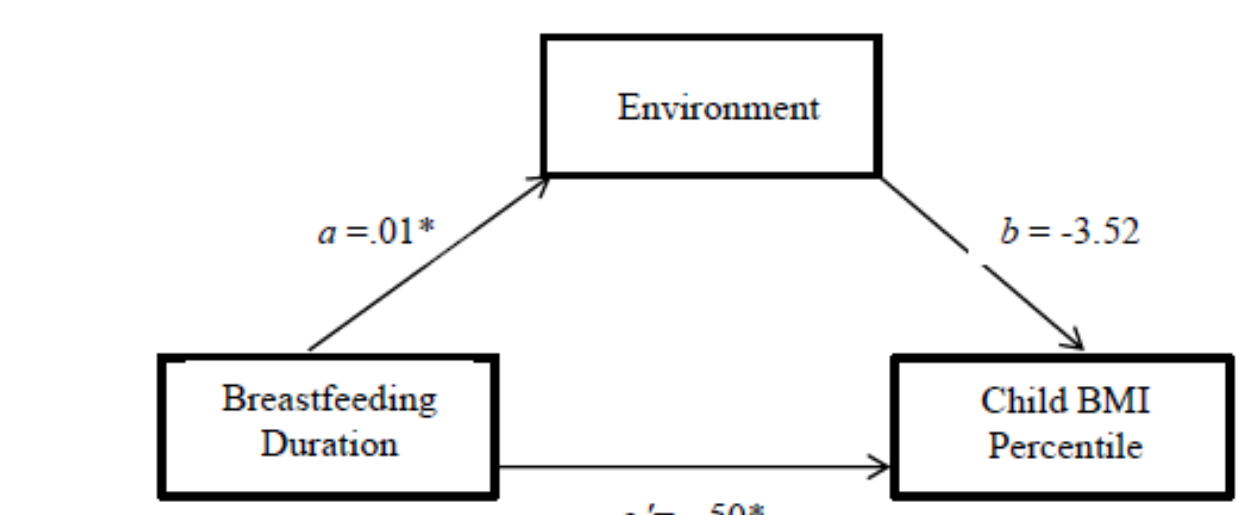


Figure 3. a) Unstandardized regression coefficient between breastfeeding duration and child BMI percentile. b) Unstandardized regression coefficients for the relationship between breastfeeding duration and child BMI percentile as mediated by Environment. Note. * $p < .05$. Listwise N=204.

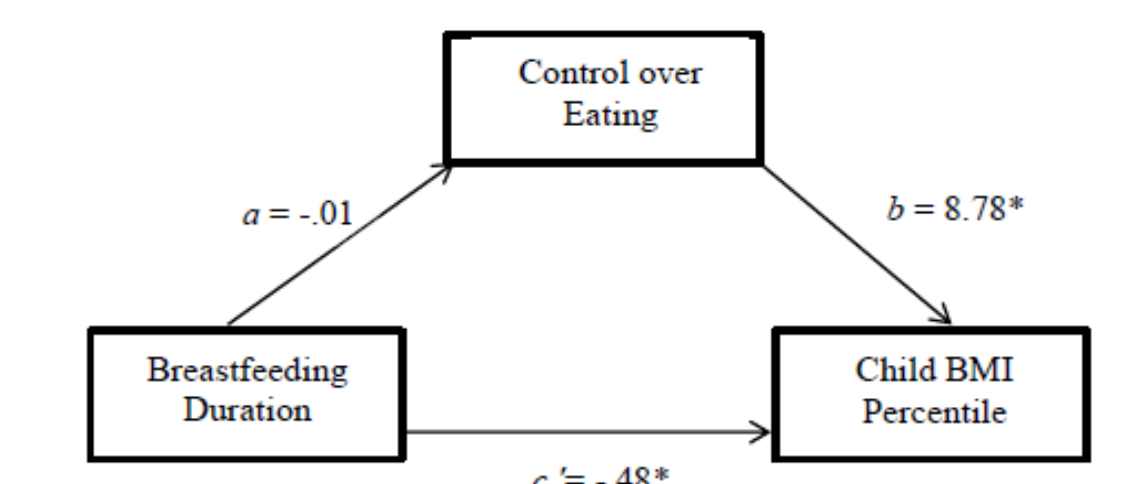


Figure 4. a) Unstandardized regression coefficient between breastfeeding duration and child BMI percentile. b) Unstandardized regression coefficients for the relationship between breastfeeding duration and child BMI percentile as mediated by parent Control over Eating. Note. * $p < .05$. Listwise N=204.

Discussion

- Consistent with previous findings on breastfeeding duration and BMI, the current study yields support for the protective effects of breastfeeding duration and later BMI (DiSantis, et al., 2013; Gillman et al., 2001; Ip et al., 2007; Metzger & McDade, 2010).
- Findings suggest that children who are breastfed longer are more responsive to their internal hunger and satiety cues and have a lower desire to eat.
- Indication that food responsiveness may have a unique mediating effects linking breastfeeding to child BMI in preschool-aged children.

Limitations

- Weak Chronbach's alpha levels for parent feeding practices subscales.
- Parent report data for child eating behaviors and parental feeding practices.

Future Directions

- Explore parental feeding measures with diverse samples of low-income participants to determine if the use of the scales among such populations are valid measures of parental feeding practices.
- Implement observational components or prospective approaches that include the home environment to gain a greater understanding of the association between child eating behaviors and parental feeding practices.

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