ENCYCLOPEDIA
on Early Childhood
Development

[Archived] Determinants and Consequences of Pediatric Obesity: Comments on Chaput and Tremblay, and Ventura, Savage, May and Birch

Jennifer O. Fisher, PhD, Eric A. Hodges, PhD

Baylor Collegeof Medicine, USA

June 2006

Introduction

Scientists have long suspected that child feeding has a fundamental influence on the development of eating behaviour and susceptibility to obesity. Beginning in the 1960s, noted psychiatrist Hilde Bruch postulated that a chronic mismatch between feeding and the internal states of hunger and satiety in the child might produce obesity by impairing the child's ability to discriminate nutritional-need-based sensations from other tensions or needs.[1] In 1969, Ainsworth and Bell's detailed observations of feeding interactions provided some of the first empirical evidence of a correspondence between infant weight and the degree to which infant feeding practices were responsive to the infant's eating cues.[2] Chaput and Tremblay, as well as Ventura et al., present empirical findings that have emerged largely over the past two decades to affirm

©2006-2026 ABILIO | CHILD OBESITY

and further articulate the contribution of feeding to the early development of eating and obesity. Ventura, Savage, May and Birch review behavioural, familial and psychosocial influences on feeding experiences in the first five years of life and the implications for overweight among children. Chaput and Tremblay focus on the interaction of genetic predispositions for self-regulation with nutrition and lifestyle environments. In the following commentary, we consider two themes highlighted in these papers: To what extent is the development of eating behaviour modifiable? What facets of early feeding experiences appear to be most critical to the development of healthful eating and weight?

Research and Conclusions

To what extent is eating learned?

Ventura et al. acknowledge the multifactorial nature of childhood obesity and the likely transactions between nature and nurture in its etiology. Chaput and Tremblay echo this view, characterizing the problem as a failure of the self-regulatory system to modulate environmental influences. Their reference to studies of neuroendocrine control of body weight highlights genetic explanations for variability in the effects of the environment on child weight status. Both sets of authors also make the case for the role of behaviour, in terms of both the child's behaviour and that of the caregiver. For example, learned effects on the self-regulation of intake are cited in both papers as a potential explanation for the protective effects of breastfeeding on child obesity, where the method of feeding dictates caregiver behaviour towards the infant as well as the child's behavioural response. Early preventive and interventive efforts, which Chaput and Tremblay note are more cost-effective than treatment, center on the modification of child eating behaviour. In this regard, it may be helpful to further articulate the theoretical framework by emphasizing and distinguishing learned from unlearned aspects of behaviour itself. As cited by Ventura et al., for instance, eating in the absence of hunger among young non-Hispanic white girls has been associated with higher levels of restrictive approaches to eating.[3] A study of genetic and environmental contributions to obesity in 300 Hispanic families indicates that this behaviour also has a significant heritable component.[4]

What feeding experiences promote and protect against the development of overweight?

Responsive feeding is characterized by prompt, contingent and developmentally appropriate reactions to the child's eating cues. Responsiveness has previously been considered in general

©2006-2026 ABILIO | CHILD OBESITY

parent-child interaction quality during feeding,[5] mother-infant interaction in failure-to-thrive[6] and feeding styles with particular relevance for child malnutrition,[7-9] but has been virtually unstudied in the context of overnutrition and development of overweight in infancy and toddlerhood.

The findings of two studies cited by Ventura et al. reveal that the experience of breastfeeding may facilitate self-regulation during toddlerhood by causing mothers to use lower amounts of restriction in toddler feeding. Indeed, there is some indication that breastfeeding is driven by infant cues to a greater extent than bottle-feeding. Wright et al. report that mothers who bottle-fed their infants reported less awareness of variation in their infant's hunger state across the day than mothers of breastfed infants.[10] Further, observations of mother-infant pairs at one week, one month and two months of age reveal that mothers who bottle-fed initiated a greater proportion of feeding starts and stops than mothers of breastfed infants.[11] These differences do not imply that bottle-feeding is necessarily less responsive than breastfeeding, but rather highlight the potential importance of caregiver responsiveness in feeding. Also relevant in this discussion is limited and mixed evidence presented by Ventura et al. regarding early introduction to complementary foods and overweight among infants. A recent study found that early introduction to complementary foods (<16 wk) in combination with a short duration of breastfeeding (<20 wk) was associated with higher weight gains from birth to one year.[12] Understanding maternal feeding goals, for example the intent of early introduction to complementary foods, and perceptions of the infant's adequacy of eating, may help to clarify the influence of maternal behaviour on infant eating and growth outcomes.

In contrast to infancy, relatively more is known about the role of feeding in the behavioural controls of intake in the preschool period. Ventura et al. indicate that while evidence of effects on overweight is not appreciable, feeding practices characterized by high levels of restriction and pressure to eat appear to disrupt the behavioural controls of food intake and have unintended effects on food preference. It is also possible that practices affording the child complete autonomy in feeding may also be problematic in the current dietary environment of excess. In a study of low-income Hispanic and African-American families with preschool-aged children, those with indulgent parents had higher body mass index z scores compared to children with authoritarian parents.[13] Laboratory studies reveal that large portions promote intake at meals in children as young as two years of age[14,15] and survey data show associations of daily energy intake with average food portion size among infants and young children.[16,17] This research suggests that exposure to large portions may promote excessive intake in children and reinforces

©2006-2026 ABILIO | CHILD OBESITY

Chaput and Tremblay's recommendations for parental guidance on appropriate diet and portion sizes. It is unclear whether children's routine exposure to large food portions arises from parental misperceptions of appropriate portion sizes for young children and/or permissive approaches to feeding.

Issues of environmental and developmental context are important but have been relatively rarely addressed in previous investigations of feeding styles and their effects on child intake. In geographic areas in which malnourishment is common, permissive or laissez-faire feeding that promotes almost exclusive infant and toddler autonomy in eating has been associated with high levels of malnourishment[7,18] and feeding that relies upon active encouragement to eat has been proposed as a way of addressing malnourishment in these contexts.[7] As Ventura et al. note, Klesges and colleagues found a positive association between parental encouragement to eat and infant weight status. In contrast, Ventura et al. cite literature that addresses the potential role of caregiver encouragement of some foods in decreased intake in older children. Research is needed to evaluate the extent to which effects are dependent upon the child's age and/or development, with techniques that facilitate intake in the younger child becoming counterproductive as the older child begins to assert more autonomy.

Given what is known about the role of social learning in child development, the potential capacity of modelling to influence children's eating behaviours has considerable intuitive appeal. As Ventura et al. note, however, scientific inquiry on this topic has been limited. While experimental research has provided evidence of a causal influence on food selection, very little is known about the influence of social learning on the behavioural controls of intake. Observational studies showing associations between parental and child behaviour are suggestive but other mechanisms cannot be ruled out, pointing out the need for experimental research on the topic. In regard to the study by Cutting et al. (1999), Ventura et al. suggest that the role of maternal disinhibition in their daughters' overweight status may arise through the child's adoption of mother-modelled behaviours. While this is plausible, an alternative explanation may be that maternal disinhibition could affect the way that mothers interact with their daughters during feeding.

Finally, research cited by Ventura et al. supports a causal role played by repeated exposure in facilitating food acceptance. Indeed, findings on this topic have been incredibly consistent across studies, affirming that young children's eating reflects the dietary environments to which they are exposed. This work underscores the critical opportunity for caregivers to support children's

intake of micronutrient dense foods that may not be initially accepted by committing to make those foods available in the face of repeated rejection. Less well characterized is how repeated exposure acts to facilitate liking during the weaning period. There is some suggestion of developmental effects, whereby infants may require less exposure to facilitate liking than preschool-aged children.19 Whether repeated exposure to fruits and vegetables indirectly prevents overconsumption of energy-dense foods by young children is a potentially interesting line of inquiry that remains to be systematically addressed.

Implications for Policy and Services Perspective

Given the variation in genomic structure and environmental risk, one-size-fits-all prevention efforts are unlikely to produce uniform results. From a policy and services perspective, both the child and the environment surrounding feeding will require assessment to identify factors that may interact to contribute to obesity. For example, Chaput and Tremblay suggest that screening for known genetic determinants of obesity “may become routine.” Elucidating the parameters of both genetic susceptibility and modifiable aspects of behaviour will ultimately serve the success of such efforts by tailoring the guidance to individual risk. This is not to suggest, however, that general recommendations are not warranted. As noted by both sets of authors, approaches to feeding that are responsive to the child’s cues provide necessary support for developing behavioural controls of food intake. To that end, promotion of exclusive breastfeeding during the first four to six months and delayed introduction of complementary foods until the child is developmentally ready for them appear to be prudent recommendations. Research in this area is sorely needed to address the development of the volitional aspects of children’s ability to regulate energy intake.

Both groups of authors cite evidence regarding the importance of the first five years of life for the development of eating that promotes healthy growth or overweight. Rapid weight gain during infancy, independent of birth weight and parental weight, has also been found to be predictive of overweight during childhood and young adulthood.[20-24] Furthermore, overweight in infancy tends to increase the risk for subsequent overweight in childhood, and this risk appears to increase with age.[25] Behavioural and nutritional contributions to rapid weight gain are poorly understood, but may represent an important target for early preventive efforts.

The developmental transition in feeding from infancy through toddlerhood is remarkable in its degree of change over such a relatively short time. The infant begins life wholly dependent on

©2006-2026 ABILIO | CHILD OBESITY

the caregiver, with nutrition typically coming from a single source (milk) and via a single method (sucking). By the time the infant becomes a toddler, he or she will most likely have made the transition to a diet closely approximating that of an adult, and will have developed the ability to self-feed, manipulating eating utensils and cups with little assistance. From toddlerhood to the preschool years, an amazing amount of socialization occurs that indoctrinates children to the customs of their culture, and more locally their family. The fact that such significant development occurs relatively rapidly and necessarily involves the caregiver suggests that the first years of life constitute a sensitive period in which the child's self-regulation can be supported or undermined to affect growth. Effective prevention efforts demand elucidation of the means by which caregiver feeding decisions and behaviours are aligned with the goal of healthful nourishment and growth.

Chaput and Tremblay suggest that public health campaigns targeted at children may be effective interventions against childhood overweight. This approach may be effective for older children, but it assumes that the environment will provide the necessary conditions for newly learned behaviours to succeed. For young children, caregiver decisions and behaviours determine environmental conditions that will support or hinder success. Chaput and Tremblay cite the American Academy of Pediatrics' 2003 policy statement on prevention of pediatric overweight and obesity. Key to these recommendations is that pediatric primary care is an important venue for interactions with families and children. Prevention counselling should be targeted to all those who care for the child. This includes not only parents, but extended family members and other care-providers, such as daycare staff, who are responsible for the child.

References

1. Bruch H. *Eating disorders: Obesity, anorexia nervosa, and the person within*. New York, NY: Basic Books; 1973.
2. Ainsworth MDS, Bell SM. Some contemporary patterns of mother-infant interaction in the feeding situation. In: Ambrose A, ed. *Stimulation in early infancy*. New York, NY: Academic Press; 1969:133-163.
3. Birch LL, Fisher JO, Davison KK. Learning to overeat: maternal use of restrictive feeding practices promotes girls' eating in the absence of hunger. *American Journal of Clinical Nutrition* 2003;78(2):215-220.
4. Fisher JO, Butte N, Jaramillo S. Eating in the absence of hunger as a behavioral phenotype of overweight Hispanic children. *Obesity Research* 2003;11(Suppl S):A97.
5. Sumner G, Spietz A. *NCAST: Caregiver/parent-child interaction teaching manual*. Seattle, Wash: NCAST Publications, University of Washington, School of Nursing; 1994.
6. Chatoor I, Hirsch R, Ganiban J, Persinger M, Hamburger E. Diagnosing infantile anorexia: The observation of mother-infant interactions. *Journal of the American Academy of Child and Adolescent Psychiatry* 1998;37(9):959-967.
7. Engle PL, Bentley ME, Pelto G. The role of care in nutrition programmes: Current research a research agenda. *Proceedings of the Nutrition Society* 2000;59(1):25-35.

©2006-2026 ABILIO | CHILD OBESITY

8. Dewey K. *Guiding principles for complementary feeding of the breastfed child.* Washington, DC: Pan American Health Organization, World Health Organization; 2003. Disponible sur le site: http://www.who.int/nutrition/publications/guiding_principles_compfeeding_breastfed.pdf. Accessed May 29, 2006.

9. Pelto GH, Levitt E, Thairu L. Improving feeding practices: Current patterns, common constraints, and the design of interventions. *Food and Nutrition Bulletin* 2003;24(1):45-82.

10. Wright P. Learning experiences in feeding behaviour during infancy. *Journal of Psychosomatic Research* 1988;32(6):613-619.

11. Wright P, Fawcett J, Crow R. The development of differences in the feeding behaviour of bottle and breast fed human infants from birth to two months. *Behavioural Processes* 1980;5(1):1-20.

12. Baker JL, Michaelsen KF, Rasmussen KM, Sorensen TIA. Maternal prepregnant body mass index, duration of breastfeeding, and timing of complementary food introduction are associated with infant weight gain. *American Journal of Clinical Nutrition* 2004;80(6):1579-1588.

13. Hughes SO, Power TG, Orlet Fisher J, Mueller S, Nicklas TA. Revisiting a neglected construct: parenting styles in a child-feeding context. *Appetite* 2005;44(1):83-92.

14. Rolls BJ, Engell D, Birch LL. Serving portion size influences 5-year-old but not 3-year-old children's food intakes. *Journal of the American Dietetic Association* 2000;100(2):232-234.

15. Fisher JO, Rolls BJ, Birch LL. Children's bite size and intake of an entree are greater with large portions than with age-appropriate or self-selected portions. *American Journal of Clinical Nutrition* 2003;77(5):1164-1170.

16. Fox MK, Devaney B, Reidy K, Razafindrakoto C, Ziegler P. Relationship between portion size and energy intake among infants and toddlers: evidence of self-regulation. *Journal of the American Dietetic Association* 2006;106(1):S77-S83.

17. McConahy KL, Smiciklas-Wright H, Mitchell DC, Picciano MF. Portion size of common foods predicts energy intake among preschool-aged children. *Journal of the American Dietetic Association* 2004;104(6):975-979.

18. Dettwyler KA. Styles of infant feeding: parental/caretaker control of food consumption in young children. *American Anthropologist* 1989;91(3):696-703.

19. Birch LL, Gunder L, Grimm-Thomas K, Laing DG. Infants' consumption of a new food enhances acceptance of similar foods. *Appetite* 1998;30(3):283-295.

20. Stettler N, Zemel BS, Kumanyika S, Stallings VA. Infant weight gain and childhood overweight status in a multicenter, cohort study. *Pedatrics* 2002;109(2):194-199.

21. Reilly JJ, Armstrong J, Dorosty AR, Emmett PM, Ness A, Rogers I, Steer C, Sherriff A. Early life risk factors for obesity in childhood: cohort study. *British Medical Journal* 2005;330(7504):1357-1359.

22. Cameron N, Pettifor J, De Wet T, Norris S. The relationship of rapid weight gain in infancy to obesity and skeletal maturity in childhood. *Obesity Research* 2003;11(3):457-460.

23. Stettler N, Kumanyika SK, Katz SH, Zemel BS, Stallings VA. Rapid weight gain during infancy and obesity in young adulthood in a cohort of African Americans. *American Journal of Clinical Nutrition* 2003;77(6):1374-1378.

24. Stettler N, Stallings VA, Troxel AB, Zhao J, Schinnar R, Nelson SE, Ziegler EE, Strom BL. Weight gain in the first week of life and overweight in adulthood: a cohort study of European American subjects fed infant formula. *Circulation* 2005;111(15):1897-1903.

25. Mei ZG, Grummer-Strawn LM, Scanlon KS. Does overweight in infancy persist through the preschool years? An analysis of CDC Pediatric Nutrition Surveillance System data. *Sozial-Und Praventivmedizin* 2003;48(3):161-167.

©2006-2026 ABILIO | CHILD OBESITY