

Brain Response to Eating and Other Factors that May Contribute to Weight Retention in Postpartum Women (PPW) and Nulligravida Women (NGW)

Authors: Lisa Lanza,¹ Stella L. Volpe,² Eram Albajri,³ Michael L. Bruneau Jr.,¹ June A. Horowitz,⁴ Bobbie Posmontier,⁵ Meltem Izzetoglu,⁶ Jennifer A. Nasser⁴

Affiliations: ¹Drexel University, Philadelphia, PA; ²Virginia Polytechnic Institute and State University, Blacksburg, VA; ³King AbdulAziz University, Jeddah, Saudi Arabia; ⁴University of Massachusetts, Amherst, MA; ⁵Jefferson University, Philadelphia, PA; ⁶Villanova University, Villanova, PA.

Award Recipient Contact: Lisa Lanza, lm1348@drexel.edu



Rationale

Women who enter pregnancy with high body mass index (BMI) or who gain weight too fast during pregnancy tend to retain more weight after each delivery.¹ The postpartum period (defined) is important in controlling weight retention that may be a cause of chronic diseases, and therefore must be addressed.^{2,3} Preliminary studies in our laboratory suggest that certain patterns of prefrontal cortex (PFC) activation during eating (assessed using functional near infra-red spectroscopy, fNIRS) may be a neural biomarker of increased risk for overconsumption of food, a main contributor to obesity. Physical activity (PA), a major contributor to weight maintenance, was also assessed using a standardized questionnaire.⁴

fNIRS measures PFC activity in response to stimuli and can distinguish lateral PFC (lPFC), involved in response inhibition, and medial PFC (mPFC), responsible for reward-related decision making.^{5,6} We extended our findings on PFC activation during eating to a group of post-partum women (PPW) compared to nulligravida women (NGW). In this study, thirty participants (20 NGW, 10 PPW) attended a single laboratory session. fNIRS measurements were taken during a period of ad libitum eating. Intuitive eating was measured using the Intuitive Eating Scale (IES).⁷ Habitual PA and age were self-reported; BMI was calculated from measured body weight and height, and food intake was calculated from measured pre- and post-eating weight of test food. Correlation analyses were performed between PFC activity, food consumption, IES and PA.

Summary of Results

Within group analyses revealed that in NGW, IES is negatively correlated with mPFC vs. lPFC activity

($r = -0.564$, $p = 0.029$). In PPW, IES is negatively but not significantly correlated with mPFC vs. lPFC activity ($r = -0.117$, $p = 0.826$). Additionally in PPW, PA was positively correlated with mPFC vs. lPFC activity ($r = 0.920$, $p = 0.003$), in NGW it is positively correlated as well but not significant ($r = 0.167$, $p = 0.509$).

Research Implications

Identifying individuals with PFC patterns associated with increased food intake may provide an objective means for crafting and assessing personalized interventions for preventing obesity. In addition, these interventions could focus on understanding satiety and hunger cues based on how intuitive eating shows to reduce the amount of food consumed.

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. This article was funded in part by Mead Johnson Nutrition/Research Dietetic Practice Group Student Pilot Grant Award and unrestricted department funds.

References

1. Brown JE. Nutrition Through the Life Cycle, 6th Edition. In. Vol 2017. Beaverton: Ringgold Inc; 2017.
2. Rooney BL, Schauberg CW. Excess pregnancy weight gain and long-term obesity: one decade later. *Obstet Gynecol.* 2002;100(2):245-252.
3. Linne Y, Neovius M. Identification of women at risk of adverse weight development following pregnancy. *Int J Obes.* 2006;30(8):1234-1239.
4. Rubenstein JH, Morgenstern H, Kellenberg J, et al. Validation of a new physical activity questionnaire for a sedentary population. *Dig Dis Sci.* 2011; 56(9): 2678 – 2687.
5. Winter SR, Yokum S, Stice E, Osipowicz K, Lowe MR. Elevated reward response to receipt of palatable food predicts future weight variability in healthy-weight adolescents. *The American Journal of Clinical Nutrition.* 2017;105(4):781-789.
6. Batterink L, Yokum S, Stice E. Body mass correlates inversely with inhibitory control in response to food among adolescent girls: An fMRI study. *Neuroimage.* 2010;52(4):1696-1703.
7. Tylka TL, Kroon Van Diest AM. The intuitive eating scale-2: item refinement and psychometric evaluation with college women and men. *J Couns Psychol.* 2013; 60 (1): 137 – 153.