**Title**: Food-related visual attention in Prader-Willi syndrome during the early stages of hyperphagia

**Authors**: Charlotte Lubowe, BA1 & Anastasia Dimitropoulos, PhD 1

**Introduction**: Hyperphagia is a unique and often dangerous condition associated with Prader-Willi syndrome (PWS) that causes extreme feelings of hunger that are not satiated even after eating. As hyperphagia progresses, individuals become increasingly preoccupied with food and often develop food seeking behaviors (Miller et al., 2011). Recent research suggests that eye tracking can provide valuable insight into individuals' attention allocation and interest in various types of food (Castellanos et al., 2009; Werthmann et al., 2010). This study evaluates children with PWS’s visual attention towards high- and low- calorie foods in comparison to nonfoods and investigates whether hyperphagia severity is positively associated with increased visual attention towards foods of varying calorie amounts. We predict that children with PWS will show a preference for high-calorie foods over low-calorie foods and nonfood stimuli and that as hyperphagia severity increases, visual attention towards food stimuli will also increase.

**Method**: 39 children with PWS (ages 3 - 12) participated in an eye-tracking task where an array of images that contained pictures of high- and low- calorie foods and nonfoods were shown while a computer-mounted eye tracker recorded their eye gaze. Half of the images contained animals, as a high-interest contrast item (Miller et al., 2007), and the other half contained mundane objects, as a neutral contrast. As the child completed the visual exploration task (Key & Dykens, 2018), caregivers completed the Hyperphagia Questionnaire - Clinical Trials (HQ-CT: Dykens et al., 2007) and a clinical interview on nutritional phase status (Miller et al., 2011) to assess the severity of their child’s hyperphagia. A two-way repeated measures ANOVA was conducted to analyze how the calorie amount of food (Stimuli type: high-calorie, low-calorie, nonfood) and the interest level of nonfood (Condition type: high-interest, low-interest) influence visual attention (Fixation duration). Correlation analyses were conducted to determine if hyperphagia severity and nutritional phase are associated with increased visual attention towards foods of varying calorie amounts.

**Results**: The 2x3 ANOVA showed a significant interaction between the type of stimuli and the contrast condition (*p* = .02, partial η2  = .11). Visual attention towards high- and low-calorie foods depended on the interest level of the nonfood stimuli that was presented as a contrast. In the low-interest contrast condition (objects), low-calorie foods attracted significantly more attention than nonfoods (*p* <.001), but only slightly more than high-calorie foods. However, in the high-interest condition (animals), there were no significant differences between high-calorie foods, low-calorie foods, and nonfoods. Correlation analyses revealed a positive association between HQCT scores and fixations on high-calorie foods, but only in the high-interest animal conditions, *rs*(37) = .39, *p* = .02. In addition, nutritional phase had a positive correlation with visual attention towards low-calorie foods (*rs*(37) = .34, *p* = .04) in the high-interest animal condition.

**Discussion:** This study demonstrates the potential of eye tracking as a measure of visual attention and hyperphagia severity in children with PWS. Visual attention towards both food groups depended on the type of nonfood presented in tandem. When animals were presented, high-calorie foods, low-calorie foods, and animals all elicited similar levels of visual attention. This lack of attention bias towards foods is consistent with previous research, which found that individuals with PWS pay similar amounts of attention to pictures of foods and animals (Key & Dykens, et al., 2018). Although calories did not seem to influence overall visual attention in this condition, correlation analyses revealed that children in the later stages of hyperphagia are more likely to fixate on low-calorie foods and those with higher reports of symptom severity often fixate longer on high-calorie foods. The low-interest arrays tell a different story – calories had a significant impact on the allocation of visual attention, but visual attention towards high- and low-calorie foods was not correlated with hyperphagia severity or with nutritional phase. Surprisingly, in the low-interest condition, children paid the most attention to low-calorie foods. While this finding is contrary to our hypothesis, it may be explained by the child’s level of familiarity with each of the presented foods, considering that many families of children with PWS are encouraged to restrict access to unhealthy foods (Dykens et al., 2024) and familiar stimuli typically attract more visual attention than unfamiliar stimuli (Nahari et al., 2019). Further implications of these findings will be discussed.

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