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Determinants of accurate compensation for previous energy intake over 1 h

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As overweight and obesity continue to rise it becomes increasingly important to understand and aid the control of food intake. Food intake in human subjects is highly variable but regulation on a short-term basis is demonstrated by some individuals[1]. Understanding the determinants of accurate energy regulation may aid weight control. The present study investigated the role of a number of likely predictors of accurate compensation for previous energy intake over a 1 h period in the laboratory.

Accurate compensation for previous energy intake was assessed by measuring energy intake at an *ad libitum* pasta meal 1 h following a low-energy (LE; 246 kcal) and a high-energy (HE; 607 kcal) milkshake preload. Energy compensation was calculated by dividing the difference in energy intake at the two test meals by the difference in energy content of the two preloads and multiplying by 100 to provide a percentage, where 100 % compensation represents perfect compensation, <100 % represents incomplete compensation (i.e. over-consumption in the HE condition relative to the LE condition) and >100 % represents overcompensation. Accuracy of energy compensation was also calculated as the difference from 100 % compensation. Likely predictors of energy compensation that were measured were: gender, age, measured BMI, measured waist:hip ratio, % body fat; dietary restraint, emotional eating; external eating[2,3], physical fitness (heart rate following the YMCA step test)[4], habitual physical activity levels[5]; ten procedural variables including order of presentation of the preloads.

Participants (n 105) with a wide range of all anthropometric and lifestyle variables took part in the study. Values of energy compensation ranged from −104 % to 300 % with a mean of 57 (SD 67) %, where 74 % of participants demonstrated incomplete compensation (<90 %), 9 % of participants demonstrated accurate compensation (100 ± 10 %) and 17 % of participants demonstrated overcompensation (>110 %). Accuracy of energy compensation ranged from 2 % (accurate) to 204 % (inaccurate), with a mean of 65 (SD 47) %. Using multivariate linear regression analysis greater energy compensation was significantly associated with a lower age (B −2.39; P<0.01). Accuracy of energy compensation was significantly associated with a lower age (B 1.81; P<0.01) and experience of the HE preload before the LE preload (B −21.8; P<0.01).

These findings suggest first that energy regulation over 1 h in the laboratory is highly variable and that the majority of individuals show incomplete compensation for previous energy intake, i.e. they overconsume energy in the HE condition relative to the LE condition. These patterns have been demonstrated previously[5,6]. Second, the variance in energy compensation is explained by the age of the participants and the variance in accuracy of energy compensation is explained by age and order of presentation of the preloads. Effects of age have been previously demonstrated[6,7] and may suggest a deterioration in the ability to detect and/or adjust for energy intake with age[7]. Effects of order of presentation suggest that more accurate compensation is achieved when individuals are required to adjust for missing energy as opposed to additional energy, effects that have also been demonstrated previously[7]. Of importance, however, age and order of presentation were the only significant predictors of energy compensation in the study and they account for only 11–16 % of the variance. These findings suggest that while age and previous experience may be important, compensation for energy intake over 1 h is only very loosely controlled.

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