EFFECTIVE DIETING AND ENERGY BALANCING IN INDIAN OBESE WOMEN

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ABSTRACT

Exercise may acutely and chronically up-regulate appetite and energy intake in overweight and obese women preventing body mass reduction in the long term. Overweight and obese women may be most prone to compensatory responses to exercise but the possible mechanism for this is unclear. Appetite regulating hormones have been investigated as a possible mechanism but to date the evidence is somewhat mixed.

Identifying compensatory energy intake responses in overweight and obese women is complicated by the high prevalence of dietary under-reporting in this group. The laboratory-based buffet meal method has frequently been used in research studies that have assessed food intake in these women, but this method has only undergone preliminary validation.

Dietary restraint may also affect individual appetite responses to exercise; it has been theorised that restraint may be a behavioural adaptation to diminished energy requirements, and differences in physical activity levels could also contribute. Evidence thus far has produced mixed results, possibly because two distinct sub-groups of restrained eaters exist, those with flexible and rigid control of restraint. It is not known if there are differences in energy requirements between these two sub-groups.

INTRODUCTION

Obesity is a multi-factorial condition characterised by the presence of excess body fat. The terms overweight and obese describe the severity of the condition and, in adults, body mass index (BMI) is the generally accepted method of defining these terms (Grant *et al*, 2007). BMI is a means of expressing body mass independently of height, and is defined as BMI = body mass (kg)/height (m2). This formula was first devised by Adolphe Quetelet in 1832 and was originally known as the Quetelet index (Eknoyan, 2008), before being termed BMI in 1972 by Ancel Keys (Keys *et al*, 1972).

According to BMI classification, those with a BMI between 25 and 29.9 kg m-2 are termed overweight and above 30 kg m-2 are termed obese. There are different levels of obesity, as shown in table 1.1, and BMI > 40 kg m-2 is often termed as “morbidly obese”.

Table 1.1 The International Classification of adult underweight, overweight and obesity according to BMI.Source: World Health Organisation Global Database on Body Mass index (2006).

Classification	BMI(kg/m^2)	
	Principal cut-off points	Additional cut-off points
Underweight	<18.50	<18.50
Severe thinness	<16.00	<16.00
Moderate thinness	16.00 - 16.99	16.00 - 16.99
Mild thinness	17.00 - 18.49	17.00 - 18.49
Normal range	18.50 - 24.99	18.50 - 22.99
		23.00 - 24.99
Overweight	≥25.00	≥25.00
Pre-obese	25.00 - 29.99	25.00 - 27.49
		27.50 - 29.99
Obese	≥30.00	≥30.00
Obese class I	30.00 - 34.99	30.00 - 32.49
		32.50 - 34.99
Obese class II	35.00 - 39.99	35.00 - 37.49
		37.50 - 39.99
Obese class III	≥40.00	≥40.00

RECRUITMENT AND ETHICAL APPROVALS

Ethical approvals for all studies were obtained from the Faculty of Medicine Ethics Committee, CMJ University. Participants were recruited via advertisements placed in the university and local NHS staff newsletters, on the university website and on a local community website. Posters were also placed around campus, and in several local hospitals; the MGM Hospital, Jaslok Hospital Bombay Hospital and many more.

ANTHROPOMETRY AND PHYSICAL CHARACTERISTICS

Height and Body mass

Standard procedures were used for measurement of basic anthropometry. Height was measured to the nearest 0.1cm using a stadiometer (Seca 213, Seca, Birmingham, UK) and body mass was measured to the nearest 0.1kg in the fasted state using digital scales (TANITA TBF-300, Tanita B.V, Hoofddorp, The Netherlands) and taken to the nearest 0.1kg. Participants were measured and weighed in bare feet with light clothing; a correction of 0.5kg was entered before weighing to allow for the weight of clothing.

Body Mass Index (BMI)

Body mass index was calculated from measured height and body mass using the standard formula (BMI = body mass (kg)/height (m2)) (Keys et al, 1972).

Waist and hip circumference

Waist and hip circumference were measured over light clothing and after exhalation; participants stood with feet together and arms at their side for the measurement. Waist measurements were taken at the midpoint between the lower rib margin and the iliac crest in the horizontal plane. Hip measurements were taken at the maximum circumference around the buttocks, below the iliac crest. Measurements were taken to the nearest cm and waist:hip ratio was calculated by dividing waist measurement by hip measurement (World Health Organisation. Measuring obesity: classification and description of anthropometric data. Copenhagen: WHO, 1989)

CONCLUSION

The main research questions this programme of work sought to answer in overweight and obese sedentary women were:

- *Are energy intake values obtained from the laboratory based buffet meal method reliable at rest and post-exercise?*

This method was implemented in the work because it has been commonly used to assess EI in exercise intervention studies and self-reported EI data were deemed highly unreliable. This method also provided the necessary estimate of EI, not just eating patterns, which was required for these research studies.

- *Do acute and chronic exercise-induced compensatory responses in energy balance occur?*
- *Does individual variability in exercise-induced body fat reduction have an association with changes in appetite, EI and/or EE?*

- *Does acute and chronic exercise participation affect circulating acylated ghrelin and peptide YY levels, and do these hormones play a role in compensatory changes in appetite, EI and EE?*

This study aimed to investigate the existence and variability of chronic compensatory adaptations in EI and EE, as well as the potential associated changes in acylated ghrelin and peptide YY, in overweight and obese women. No evidence of either acute or chronic compensatory changes was found, indicating that overweight and obese, sedentary women do not compensate for ExEE.

- *Is dietary restraint associated with energy expenditure and physical activity levels?*

The final study in this thesis investigated EE in restrained and unrestrained eaters; it has been suggested that restrained eaters have diminished energy requirements and existing evidence is

mixed (Tuschl et al, 1990; Platte et al, 1996; Bathalon et al, 2001). No association between dietary restraint and RMR or EE was observed in a sample of forty-one women, and neither RMR nor EE differed between restrained and unrestrained overweight and obese women in this study.

- Do restrained eaters defined as having flexible or rigid control differ in their physiological energy requirements and physical activity patterns?

It was hypothesised that mixed results regarding differences in energy requirements between restrained and unrestrained may be attributable to the presence of two distinct sub-groups of restrained eaters; those with flexible and rigid control of restraint.

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