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The investigation of the effects of food texture and energy density on appetite and food intakes at a single eating occasion in older adults: A pilot study

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Texture Modified Diets (TMD) are frequently prescribed for the nutritional management of dysphagia, as well as for those with dentures and with difficulty masticating food, both which are correlated with senescence [(1)]. It is however reported that those receiving a TMD often have lower food intakes [(2)]. Another concern is the risk of nutritional displacement due to the addition of fluids in order to achieve the appropriate texture as set out in national guidelines [(3)]. In an attempt to assist individuals prescribed these diets to meet recommended energy intakes, energy dense meals are offered, however this strategy has not yet been adequately evaluated [(4)]. It is not known how effective increasing the energy density of a meal (standard or texture modified) is for improving food and energy intakes.

The aim of this research was to investigate the effect of texture modification, and/or energy enrichment of a standard meal developed to meet current recommendations for meal provision in hospitals for both 'nutritionally well' and 'nutritionally vulnerable' adults [(5)], on appetite parameters and food and energy intakes at a single eating occasion in healthy adults (aged>50 years).

Six healthy individuals (n = three males, n = three females, mean (SD) age 64.7 (8.2) years were presented with four versions of an ad libitum serving of shepherds pie (Table 1) on four separate occasions in a single blind, randomised, crossover study design. Participants were required to consume a self determined serving of the test meal until they reached satiation. The quantity of meal consumed was calculated using a plate wastage method. Appetite responses for hunger, fullness, desire to eat and palatability were measured over the one hour feeding period using 100 mm visual analogue scales (VAS). Food (g) and energy intakes (kcal) consumed during the feeding session and palatability ratings were analysed using repeated measures ANOVA with post hoc paired t-tests adjusted for multiple comparisons in SPSS v.17.0.

Food intake (g) was significantly reduced with texture modification $F(1,5) = 59.22$, $P = 0.01$ however there was no significance with energy density $F(1,5) = 0.001$, $P = 0.97$ or with the interaction of texture*energy density $F(1,5) = 2.44$, $P = 0.18$. Energy intake (kcal) was significantly reduced by texture modification $F(1,5) = 31.72$, $P = 0.02$ but increased with increased energy density $F(1,5) = 21.58$, $P = 0.06$. There was no difference in energy intake compared with standard for the interaction of texture*energy density $F(1,5) = 4.53$, $P = 0.09$. Individual differences are indicated on Table 1. Significant differences in palatability ratings of meals 2 and 3 ($P = 0.01$) were in line with differences seen in food intakes (g) at the meal.

Table 1. Mean (SEM) food (g) and energy (kcal) intakes for each meal type (n = 6)

				Food Intakes (g)		Energy Intakes(kcal)	
Meal	Description	Texture	Energy Density (kcal/g)	Mean	SEM	Mean	SEM
1	Unmodified, standard energy[(5)]	Standard	0.9 (Low)	724	124	652	111
2	Unmodified, energy dense[(5)]	Standard	1.3 (High)	776	135	1012[c]	171
3	Texture C [(3)], standard energy[(5)]	Modified	0.9 (Low)	658[a]	115	589[d]	104
4	Texture C [(3)], energy dense[(5)]	Modified	1.3 (High)	607[b]	130	752	161

[a]significantly different vs. meal 2 $p = 0.03$.
[b]significantly different vs. meal 1 $p = 0.01$.
[c]significantly different vs. meal 1 $p = 0.02$.
[d]significantly different vs. meal 2 $p = 0.01$.

It appears that texture modification results in reduced food intake of both a standard and an energy enriched meal at a single eating occasion. Energy intake at a single eating occasion may be increased by energy enrichment in both standard and texture modified meals, but whether this results in increased daily energy and nutrient intakes remains to be determined. This and further investigation into the impact of the aesthetic attributes of texture modified and energy enriched meals on food and energy intakes is required to inform optimisation of food and fluid provision.

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