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Degree of habitual mastication may be a possible cause of inter-individual variation in *in vivo* glycaemic response to whole cereals

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The degree of habitual mastication varies significantly between individuals[1], and this may be one of the causes for the considerable inter-individual variation observed in the blood glucose response (GR) to foods[2]. Previous work from our group showed that the degree of particle breakdown during mastication affects in *vitro* glycemic potency[3]. We therefore hypothesized that the degree of habitual mastication will influence individuals' *in vivo* GR to carbohydrate foods. Eleven participants came in on six non-consecutive days to the laboratory and evaluated two test foods (rice and spaghetti). They were given portions containing 50 g of available carbohydrates of each test food on 3 d. Their GR was measured for the subsequent 120 min using capillary blood samples. On two random days for each test food, the number of mouthfuls taken to finish the food portion, the number of chews per mouthful and the time taken to chew each mouthful was measured using surface electrode electromyography (EMG). At the end of the same test sessions, the participants were given 100 g of the same test food, which they masticated to the point of swallowing and expectorated into plastic containers. The particle size distribution (>2000 μm, 1000–2000 μm, 500–1000 μm and <500 μm) of this masticated food was determined on a percentage dry weight basis. GR was expressed as the incremental area under the curve for the blood glucose response (IAUC). Correlations were statistically analysed with the linear regression procedure and inter-individual variations and comparisons, using the one-way ANOVA and *t*-test procedures, respectively. Statistical significance (α) was set at $P<0.05$.

The mean number of chews per mouthful for each individual did not significantly differ for rice and spaghetti ($P = 0.227$), although participants took a significantly lower total number of mouthfuls to consume the spaghetti ($P = 0.002$). The number of mouthfuls, chews per mouthful and the chewing time per mouthful correlated significantly within each test food. Significant correlations between the degree of mastication and the GR were observed for rice, but not spaghetti. The percentages of particles >2000 μm and <500 μm in masticated rice correlated significantly with the GR at 45 min ($P = 0.002$ and $P = 0.014$), which was also the time at which the mean peak GR for rice was observed. The percentages of particles >2000 μm and <500 μm in rice also correlated significantly with the IAUC for the first 45 and 60 min post-consumption. None of these correlations were observed at a significant level with spaghetti.

These findings indicate that the degree of mastication influences the peak and total *in vivo* GR of rice. In unprocessed foods with intact grains, the extent of mechanical breakdown during mastication may determine the accessibility of the digestive enzymes to starch and thus influence its GR. Mastication may not be as important in starchy foods such as spaghetti where the grain structure has undergone considerable disintegration during processing. The results suggest that individual differences in mastication may be one cause for inter-individual differences in the GR to grainy foods such as rice.

1. Jiffry MTM (1981) Analysis of particles produced at the end of mastication in subjects with normal dentition. *J Oral Rehab* **8**, 113–119.
2. Wolever TMS (2006) *The Glycaemic Index: A Physiological Classification of Dietary Carbohydrate*. Wallingford: CABI.
3. Ranawana DV, Monro JM, Mishra S *et al.* (2010) Degree of particle size breakdown during mastication may be a possible cause of inter-individual glycemic variability. *Nutr Res* **30**, 246–254.