



## Can snacking on almonds displace discretionary foods in the diets of habitual snackers?

L.M. Ware<sup>1</sup>, A.R. Gray<sup>2</sup> and R.C. Brown<sup>1</sup>

<sup>1</sup>Department of Human Nutrition, University of Otago, P.O. Box 56, Dunedin 9054, New Zealand

<sup>2</sup>Biostatistics Centre, Division of Health Sciences, University of Otago, P.O. Box 56, Dunedin 9054, New Zealand

Snacking frequency has increased in recent years, with many snack options being nutrient-poor and likely contributing to excessive energy intakes<sup>(1,2)</sup>. At the same time, nut intakes have remained low<sup>(3)</sup>. While almonds, like many other snacks, are high in fat and energy, they are rich in beneficial unsaturated fats, fibre, vitamins, minerals, and phytonutrients. Snacking on almonds may offer substantial health advantages, including improving energy balance and overall diet quality, compared to typical modern snack foods. The healthier diets observed among nut consumers may be partially explained by addition of nuts to the diet leading to displacement of other, less desirable foods. We aimed to compare the effects of consuming a snack of almonds vs sweet biscuits or savoury crackers daily for one year on displacement of discretionary foods and food group patterns. We used a randomised controlled parallel study design involving 136 non-obese habitual discretionary snack consumers aged 18–65. Participants were randomly assigned to receive a snack of either almonds, or biscuits, daily for one year. These isocaloric snacks provided either 10% of participants' total energy requirements or 1030 kJ (equivalent to 42.5 g almonds), whichever was higher. Dietary intake was measured using three-day weighed diet records record at baseline, 3, 6, and 12 months. Of the participants, 101 (74%) were female, with a mean (SD) age of 35.6 (13.4) years and BMI of 23.7 (3.0) kg/m<sup>2</sup>. Those assigned to the almond group increased their percentage total energy (%TE) from nuts and seeds from 1.4% (baseline) to 13.8% (12 months), while those assigned to the biscuit group increased %TE from biscuits and crackers from 5.1% to 12.4%. There was a non-statistically significant ( $p = 0.053$ ) decrease in %TE from discretionary foods to 12-months for almond group compared to the biscuit group. %TE from discretionary foods decreased significantly in the almond group from baseline to 12-months (mean (95% CI) difference:  $-4.9\%$  ( $-8.3, -1.5$ )  $p = 0.005$ ), with no evidence of a change observed in the biscuit group ( $-0.0\%$  ( $-3.6, 3.6$ )  $p = 0.994$ ). Regular consumption of nuts as a snack food may improve diet quality by displacing discretionary food intake among regular discretionary snack consumers. However, the observed displacement was incomplete relative to the energy provided by the study snack. Snacking is driven by factors beyond simply satisfying hunger, including flavour, texture, and overall eating experience. We hypothesise that – among this group of discretionary snack consumers – partial displacement, and hence the continued consumption of other snack foods, was likely due to the sensory properties of consuming almonds alone being insufficient to fulfil hedonic satiation. Strategies to improve sensory appeal of almonds to discretionary snack consumers may assuage subsequent snack-seeking behaviour and provide important advantages in terms of both energy balance and diet quality.

**Keywords:** almonds; nuts; snack foods; food displacement

### Ethics Declaration

Yes

### Financial Support

This research was funded by the Almond Board of California (grant number RGA-18-BROWN-01).

### References

1. Mattes RD (2018) *Physiol Behav* **193** (Pt B), 279–283.
2. Piernas C & Popkin BM (2010) *J Nutr* **140**(2), 325–332.
3. Brown RC, Yong LC, Gray AR *et al.* (2017) *Nutrients* **9**(3), 220.