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Changes in diet quality and cognitive performance in Australian children following 8 weeks of almond consumption: a randomised, controlled cross-over feasibility trial

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Nuts are nutrient-rich, energy-dense foods that are associated with better diet quality in children[(1)], yet intake in Australian children remains low[(2)]. Prospective studies have demonstrated positive associations between nut consumption and cognitive performance in children[(3)], while randomised controlled trials (RCTs) assessing nut consumption and cognitive performance in adults have reported inconsistent findings[(4)]. This 2-phase cross-over RCT examined the feasibility of Australian children eating an almond-enriched diet (30 g almonds, 5 days per week) compared with a nut-free diet for 8 weeks each. Associated changes in diet quality, lifestyle factors and cognitive performance were also measured. Forty children (48% female, 8–13 years) who were low habitual nut consumers (< 30 g/day) and free from nut allergies and cognitive, behavioural or medical conditions that could affect study outcomes were enrolled. Feasibility outcomes included retention, compliance with study foods and changes in ratings of liking and palatability of almonds. Other outcomes were assessed before and after each 8-week diet phase, separated by a 2-week washout. Parent/guardian–child dyads completed questionnaires about diet (diet quality score), physical activity, and sleep behaviour. Sleep quality and length were recorded for 7 nights prior to clinic visits. At each visit sleepiness was captured (Karolinska Sleepiness Scale) before children completed a computerised test battery (COMPASS) to assess cognitive performance across attention/concentration, executive function, memory, processing speed and verbal fluency domains. Analyses were performed using SPSS 26.0 software with statistical significance defined as $p < 0.05$. Data were analysed using mixed effects models, with diet and time as fixed effects, a random effect of ID and controlling for diet order, age, sex and sleepiness. Retention was excellent with all participants completing the study and mean compliance with almonds was 98%. Mean liking and palatability ratings declined after 8 weeks (−23 points, $p = 0.006$) but remained favourable. There were no significant changes in diet quality, physical activity or sleep (behaviour, length or quality) during the study. Changes in cognitive performance over time and between diets ranged from trivial to small (Cohen's $d = 0.01–0.28$) for all tests, failing to reach significance except for simple reaction time (faster response over time, $d = −0.1$, $F(1,115.7) = 4.455$, $p = 0.037$) and Peg and Ball response time (faster after nut-free diet, $d = 0.28$, $F(1,115.4) = 4.176$, $p = 0.043$). This study demonstrated that it was feasible to conduct an almond-enriched dietary intervention in Australian children, with excellent retention and compliance to study requirements. Whilst significant changes were limited for scientific outcomes, this study was not designed to be powered for these outcomes. Rather, these data will be valuable for determining required sample sizes in future studies assessing nut interventions and cognitive performance in children.

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