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Validation and reproducibility of a novel flavonoid food frequency dietary assessment tool against multiple 24hr-recall over 12 months

E. Lorzadeh[1], K. Charlton[1], K. Weston-Green[2], T. McCaffrey[3], M. Batterham[4] and K. Kent[1,5]
[1]*School of Medical, Indigenous and Health Sciences, Faculty of Science, Medicine and Health, University of Wollongong, Wollongong, New South Wales, Australia*
[2]*Molecular Horizons, Faculty of Science, Medicine and Health, University of Wollongong, Wollongong, New South Wales, Australia*
[3]*Department of Nutrition and Dietetics, School of Clinical Sciences, Monash University, Melbourne, Victoria, Australia*
[4]*Faculty of Engineering and Information Sciences, University of Wollongong, Wollongong, New South Wales, Australia*
[5]*School of Health Sciences, Western Sydney University, Sydney, New South Wales, Australia*

Flavonoids, found in plant foods, are becoming increasingly recognised for their health benefits[1]. A valid, reliable and short dietary assessment tool is necessary to assess flavonoid intake, as current methods are burdensome for researchers and participants. This study aimed to evaluate the validity and reproducibility of a flavonoid food frequency questionnaire (Flav-Q), which was derived from the Kent & Charlton Flavonoid Food Frequency Questionnaire (FFQ)[2]. The Flav-Q contains 23 items and was validated against repeated 24-hour dietary recalls in an Australian adult population (18y+). The Flav-Q was administered at four time-points over 12 months period (n = 80). At each time-point, two 24-hour dietary recall surveys were completed using Intake-24[3]. Usual flavonoid intake was assessed by cross-referencing food lists with the Phenol-Explorer database and averaged using the multiple source method (MSM) for participants who had at least 4 recalls. The criterion validity of the Flav-Q at baseline was compared against the usual intake using the Wilcoxon signed-rank test, Spearman's correlation coefficient, Bland-Altman plots, and Cohen's kappa (κ)[4]. The reproducibility of the baseline Flav-Q (Flav_Q1) was compared with time points 2, 3, and 4. Mean total flavonoid intake was higher for Flav-Q1 compared to usual intake (443.2 mg/day vs 234.4 mg/day, $p < 0.001$) and overestimated subclass intake except for flavanones. Moderate to strong correlations were found between Flav-Q1 and usual intake for total flavonoids ($r = 0.66$, $p < 0.001$; $\kappa = 0.45$, $p < 0.001$) and subclasses flavan-3-ols ($r = 0.72$, $p < 0.001$; $\kappa = 0.53$; $p < 0.001$)), flavonols ($r = 0.55$, $p < 0.001$; $\kappa = 0.40$, $p < 0.001$), flavanones ($r = 0.49$, $p < 0.001$; $\kappa = 0.30$, $p = 0.007$), and a weaker non-significant correlation for anthocyanin ($r = 0.38$, $p < 0.001$; $\kappa = 0.15$, $p = 0.18$) and flavones ($r = 0.34$, $p < 0.001$; $\kappa = 20$, $p = 0.07$). Bland-Altman plots showed a large bias and wide limits of agreement (61.64%) for total flavonoid intake. Flav-Q demonstrated high reproducibility across all timepoints (Flav-Q1 vs Flav-Q2 $r = 0.82$, $p < 0.001$; $\kappa = 0.70$, $p < 0.001$), Flav-Q1 vs Flav-Q3 ($r = 0.68$, $p < 0.001$; $\kappa = 0.47$, $p < 0.001$), Flav-Q1 vs Flav-Q4 ($r = 0.63$, $p < 0.001$; $\kappa = 0.47$, $p < 0.001$). Mean percentage differences between repeated timepoints for total flavonoid ranged from 19% to 31%, with Bland-Altman plots showing good levels of agreement. Overall, the Flav-Q tool was reproducible and demonstrated some agreement for assessing the intake of total flavonoid and its subclasses. However, further validation to determine reasons for over-estimation is necessary.

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