Supplementary material

Sobieraj P, Bzikowska-Jura A, Raciborski F, et al. Is sodium and potassium intake assessed by diet-related mobile applications more harm than benefit? Kardiol Pol. 2022.

METHODS

Data Source

We used anonymized data from the 'National Study of Nutrition and Nutritional Status of the Adult Polish Population in the Years 2017–2020' trial. The purpose and methodology of the trial is described in detail elsewhere [1]. In brief, this cross-sectional study was aimed to illustrate the current health situation of the respondents in terms of nutrition and physical activity level. This study was performed in two groups of randomly selected Polish citizens (aged 19–64 years and older than 65 years). Each study group consisted of 2000 participants. The research was performed in the period 2017–2020 at the Faculty of Health Sciences of the Medical University of Warsaw at the request of the Polish Ministry of Health. The study was approved by the Institutional Ethical Review Board at the Medical University of Warsaw (Approval Nos AKBE/163/17 and AKBE/164/17).

For this report, we randomly selected 120 study participants from the database. The random selection was carried out in 6 layers based on gender and age category (19–35 years, 36–64 years and ≥65 years). Finally, 20 patients were randomly selected from each layer.

Mobile applications selection

The selection procedure of diet-related mobile applications was conducted in Polish Appstore (https://www.apple.com/pl/app-store/) between January and February 2021. The search was restricted to three relevant categories: 'Health and Fitness', 'Food and Drink' and 'Medical'. For each category we selected 200 top downloaded applications (n = 600 in total). After a detailed analysis of the description of each application, we excluded 592 applications. The exclusion criteria included: no Polish language, only paid version, no information about the calculation of sodium and potassium intake. For the remaining 8 apps, we developed following

inclusion criteria: >1 million downloads and >4.5-star rating and finally identified 4 applications (App1 = FatSecret 9.8, Secret Industries Pty Ltd, Australia; App2 = Yazio, Yazio 7.4.2. GmbH, Germany; App3 = Fitatu 3.11.0, Fitatu Sp. z o.o., Poland; App4 = MyFitnessPal 21.22.5.36915, MyFitnessPal, Inc., USA) for our trial. The applications were installed on iPhone 7. App1 was able only to calculate salt instead of sodium intake and thus we recalculated sodium intake using formula: sodium intake [mg] = salt intake [g] × 1000 / 2.5 [2].

Dietary assessment and reference method

To assess the validity of the selected mobile applications in the terms of sodium and potassium intake, two-day dietary recalls obtained in previously mentioned study were used [3]. According to European Food Safety Authority recommendations, the interviews were conducted with all participants twice, within at least 5 days of interval. Considering the variability of eating habits, the interviews were performed on different days of a week (e.g., Monday and Sunday), using computer assisted personal interviewing [4].

Nutritional assessment was based on the Dieta 6.0 software, which is the Polish reference method (RM), as it is based on Polish Food Composition Database, developed by National Food and Nutrition Institute in Warsaw. This program is used not only for research purposes (assessing individual or group nutrition), but also for planning diets. However, the main purpose of Dieta 6.0 is to calculate energy and nutrients intake (in the case of current study the calculation of sodium and potassium intake). Sizes of declared food portions and dishes were described using household measurements (e.g., tablespoon, glass) and verified using the Album of Photographs of Food Products and Dishes [5]. Then, all data were converted into gram values by experienced clinical dietitians and entered to the Dieta 6.0 software. According to the mobile applications, nutritional data was entered by the clinical dietitian between March and April 2021. All food products and mixed meals were calculated, except for natural water and dietary supplements. For each food, a corresponding match item was identified and then verified by one more researcher. For mixed dishes (e.g., spaghetti Bolognese), items with the most similar description (e.g., spaghetti with wheat noodles and beef) were chosen.

Statistical analysis

Sample size calculations were performed according to the Bland-Altman energy intake agreement criteria in our previous report, i.e. beta = 0.2, 2 alpha = 0.05, expected mean difference 0 kcal, expected standard deviation of differences 100 kcal, and maximum allowed difference between methods of 250 kcal [3]. The estimated sample size needed was 111.

The agreement between RM and tested mobile applications according to the sodium and potassium intake was assessed using Bland-Altman statistics and plots [6]. Biases (computed as means of differences between the RM and derived from applications) and lower and upper limits of agreement with 95% confidence intervals were calculated.

All computations were performed using R, environment for statistical computations (version 4.0.5, The R Foundation for Statistical Computing, Vienna, Austria).

Supplementary results

Table S1. Correlation between daily sodium and potassium intake estimated by mobile applications and the reference method

	Mobile application	**R**	***P*-value**
Sodium intake	App1	0.77	<0.001
	App2	0.50	<0.001
	App3	0.56	<0.001
	App4	0.02	0.817
Potassium intake	App1	0.82	<0.001
	App2	0.43	<0.001
	App3	0.66	<0.001
	App4	0.23	0.010

Spearman correlations coefficients between mobile application and the reference method, 120 subjects in each group

Abbreviations: App1, FatSecret; App2, Yazio; App3, Fitatu; App4, MyFitnessPal

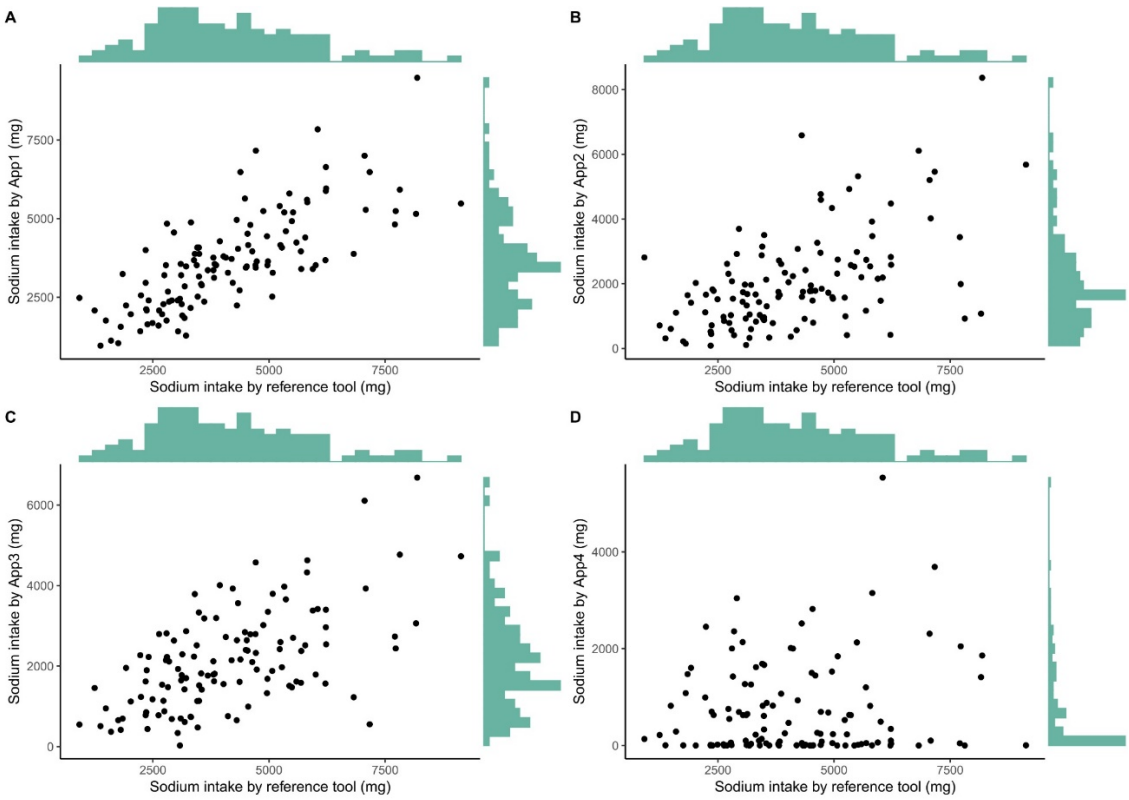

Figure 1. Correlations and histograms of sodium intake estimated by four validated mobile applications and assessed by reference method. Panel A – App1 (FatSecret), Panel B – App2 (Yazio), Panel C – App3 (Fitatu), Panel D – App4 (MyFitnessPal).

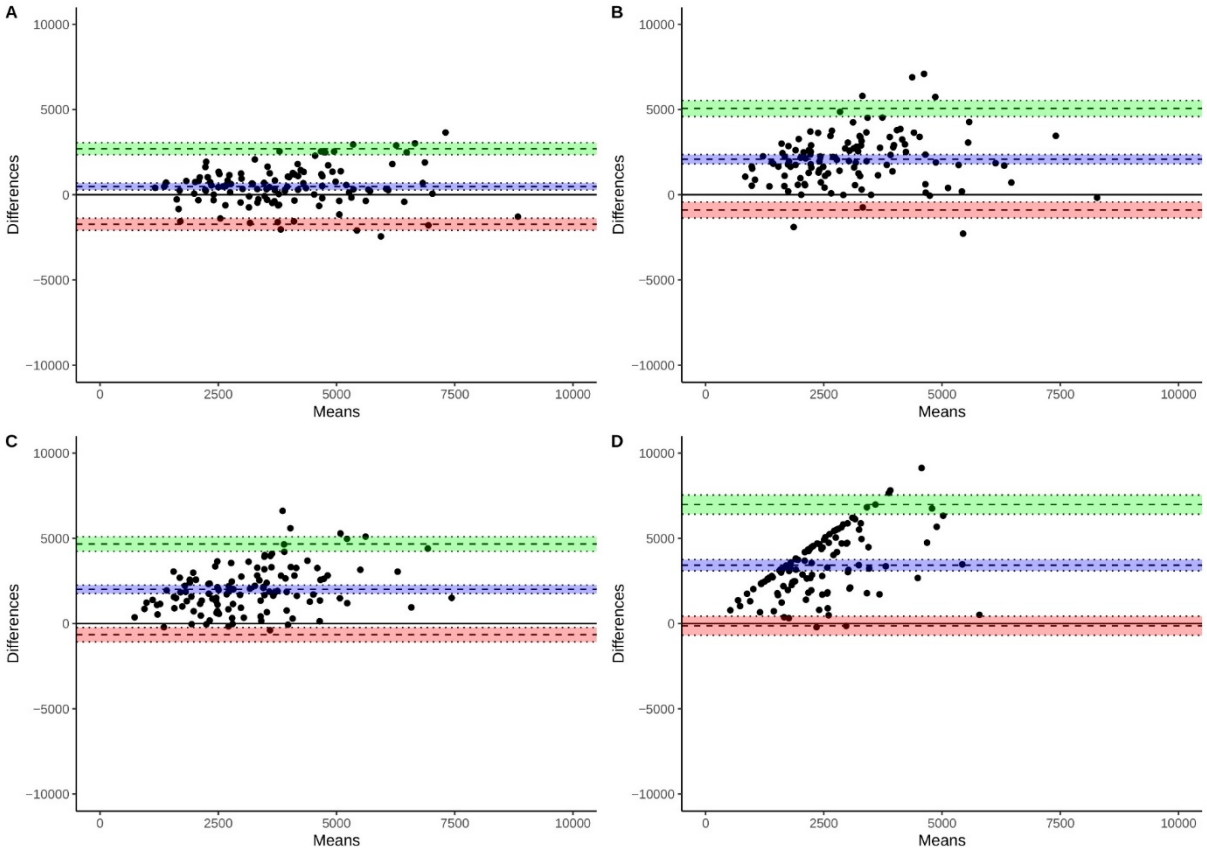

Figure 2. Bland-Altman plots presenting the agreement between validated mobile applications according to sodium intake: Panel A – App1 (FatSecret), Panel B – App2 (Yazio), Panel C – App3 (Fitatu), Panel D – App4 (MyFitnessPal) and reference method.

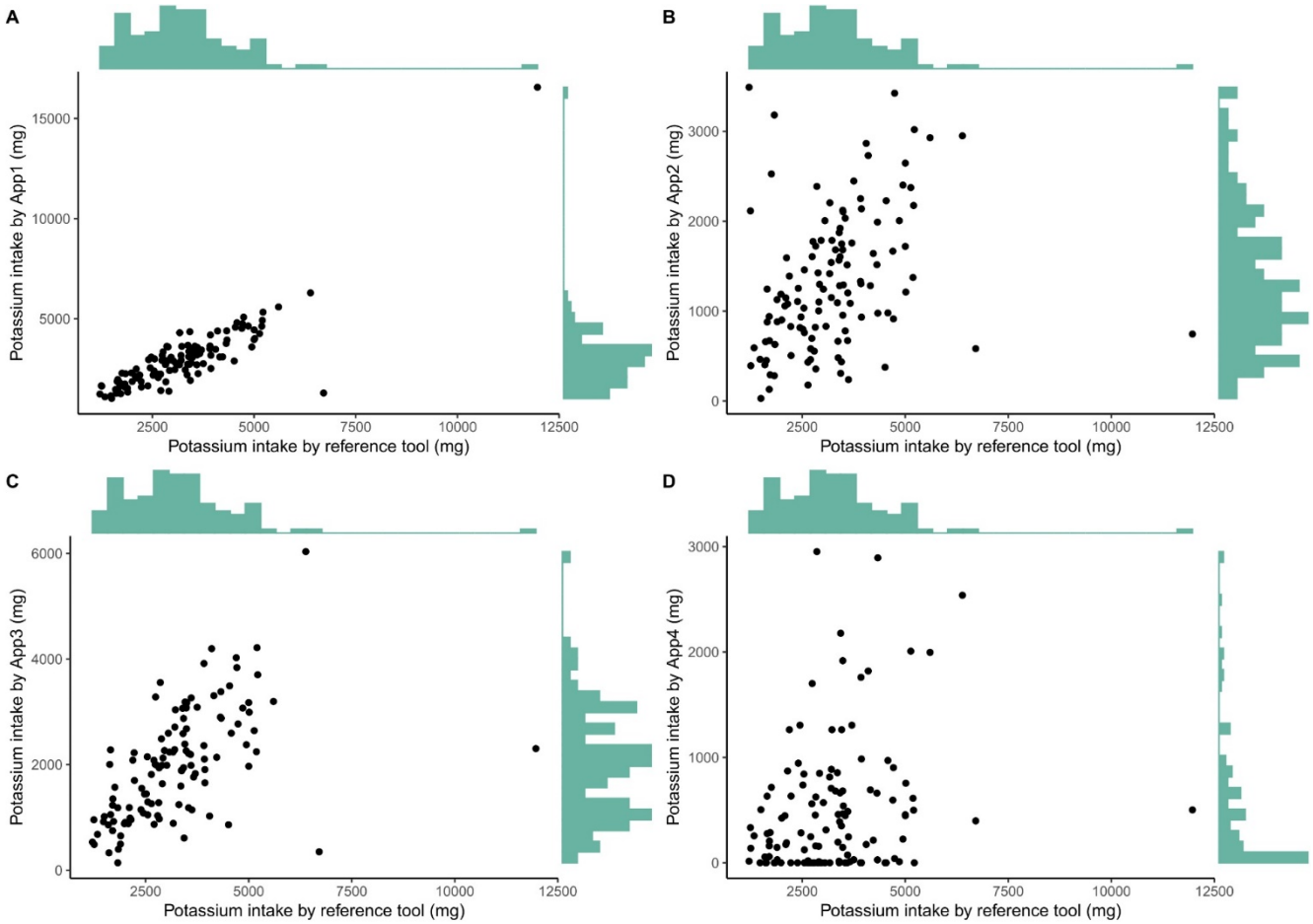

Figure 3. Correlations and histograms of potassium intake estimated by four validated mobile applications and assessed by reference method. Panel A – App1 (FatSecret), Panel B – App2 (Yazio), Panel C – App3 (Fitatu), Panel D – App4 (MyFitnessPal).

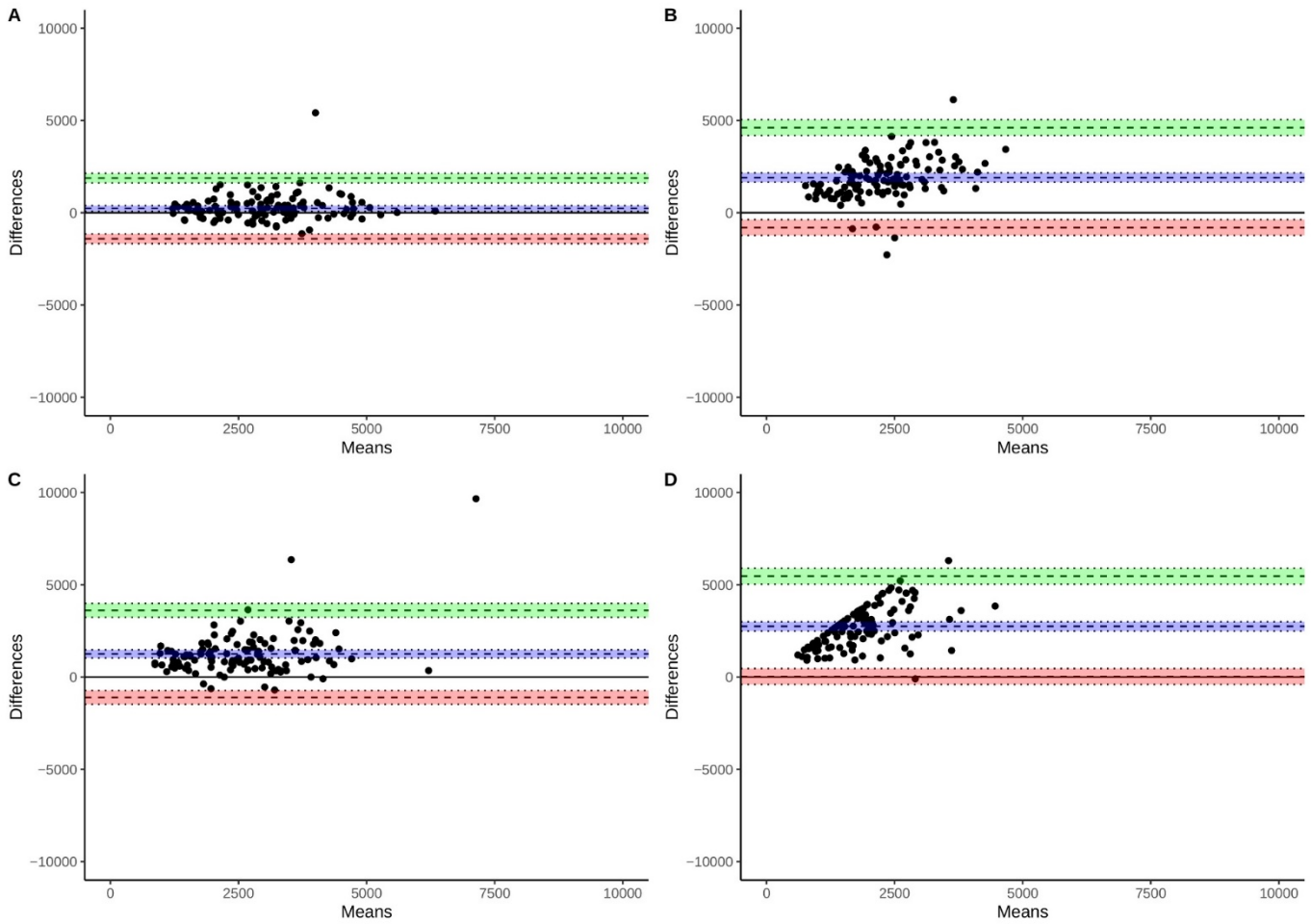

Figure 4. Bland-Altman plots presenting the agreement between validated mobile applications according to potassium intake: Panel A – App1 (FatSecret), Panel B – App2 (Yazio), Panel C – App3 (Fitatu), Panel D – App4 (MyFitnessPal) and reference method.

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