

# Validation Study of MyFitnessPal App for the Dietary Assessment among College Students non-English Speakers in Indonesia and Taiwan

Esti Nurwanti<sup>1</sup>, Chyi-Huey Bai<sup>2,3,4\*</sup>

<sup>1</sup>Department of Nutrition, Faculty of Health Science, Universitas Alma Ata, Yogyakarta, Indonesia

<sup>2</sup>Graduate Institute of Biomedical Informatics, College of Medical Science and Technology, Taipei Medical University, Taipei, Taiwan

<sup>3</sup>Department of Public Health, College of Medicine, Taipei Medical University, Taipei, Taiwan

<sup>4</sup>School of Public Health, College of Public Health, Taipei Medical University, Taipei, Taiwan

## ABSTRACT

**Background:** Dietary assessment using smartphone could solve problem related nutrition especially among college student in Indonesia and Taiwan. College students tend to choose unhealthy food in new environment that increase obesity risk. Dietary pattern in Taiwan and Indonesia were different so the validity of dietary assessment using smartphone application was important among both country. Monitoring dietary intake using smartphone are accurate, not time consuming, decrease burdensome, and low measurement error. MyfitnessPal (MFP) is a smartphone application which very helpful for monitoring dietary intake even though among non-English speaker country.

**Objectives:** The study aimed to compare the relative validity of smartphone app-based food records (MFP) versus 7-days computer-based food record for assessing energy, macronutrient and micronutrient of Taiwanese and Indonesian College Students.

**Methods:** Indonesian students (n=17) and Taiwanese students (n=9) volunteered and recorded 7-day dietary intake using MFP and 7-days computer-based food record with additional food picture. The values of energy, macronutrients and fiber from MFP were compared with data from food record, calculated using Taiwan and Indonesia food composition software. Comparisons were made between each data set using the Wilcoxon rank test, paired t-test, linear regression, and the Bland-Altman agreement plots.

**Results:** Repeated measures Bland-Altman plots showed good agreement for both methods. These finding showed that among Indonesian and Taiwanese, there was a non-significant difference in energy, macronutrients (protein, carbohydrate, fat) and sodium intake between the two methods. Moreover, some nutrients such as fiber and cholesterol found a significant difference between MFP and 7d food record.

**Conclusions:** MFP showed good relative validity, especially for energy, macronutrients (protein, carbohydrate, fat) and sodium intake.

**Keyword:** *Dietary Assessment*

## INTRODUCTION

Dietary assessment are a necessary tool to study the dietary habit of people with specific condition. Dietary recall can estimate habitual intake individually over several days with appropriate and flexible. For some epidemiological purposes, Food-Frequency Questionnaire offer rank individuals as high, medium, or low consumers of specific foods or nutrients. However, a FFQ developed in one population may not be suitable for use in another because of differences in food habits (1).

Dietary assessment has various methods, depends on cultural, literacy, and cognitive ability of the study population. However, traditional assessment method such as written food record can be expensive with the increasing number of days observed. Furthermore it also could reduce the quality of the records. Errors, either systematic or random, can affect dietary assessment at all stages of collecting and analyzing data. Using standard protocols of dietary assessment and data processing can decrease mistakes, and increasing the number of observations can reduce random errors due to diet variability. But, error associated with the assessment tool and biases introduced by the respondents can be problematic. Under-reporting of dietary intake commonly happened in the obese population and over-reporting occur in children. Social desirability may reverse dietary assessment; respondents may provide the response expected by the questionnaire rather than the true one. The estimation of portion size can be subject to systematic error (2, 3).

Smartphone apps are going to be valuable and low-cost intervention to improve dietary intake and reduce obesity. Participants prefer using smartphone app which are fast and simple so that increase awareness of food intake and weight management. The accuracy of dietary assessment using smartphone app has generally found to be good. Accuracy describes validity of the measure and reliability refers to precision or repeatability. Studies shown that dietary assessment method based on smartphone app can improve reporting of dietary

intake and also improve assessment techniques and reduced the burden on both respondent and interviewer (1, 4-6).

Many mobile-based dietary assessment available in market, either it's free or paid version. More than 200 apps available in Google Play for Android phones. The mobile phone app to record dietary habit for personal use has been studied to be effective, but the validity and feasibility of the apps to be used in research purpose has not been studied yet (7). The aims of this study was to assess the relative validity of MyFitnessPal (MFP) for dietary assessment of non-english speaker college students, against seven 24-h food records

## MATERIALS AND METHODS

### Study Participants

A total of seven teen Indonesian and nine Taiwanese volunteers were recruited from Taipei Medical University and Alma Ata University by social media advertisement. The participants were men and women students and staff aged 20-35 years from health science faculty. A total 36 participants initially volunteered for the study. Nine participants drop out due to internet network difficulty (Indonesian students). All participants provided written informed consent to participate in the study. The Research Ethics Boards at Taipei Medical University (approval code N201811016) approved the study.

### Recruitment and Setting

Study coordinator send informed consent form before the trials using LINE and whatsapp group. The inclusion criteria for this study are student age 20-35 years, owned a smartphone, have access to internet, and record 7-day food record. Participants were excluded if they were pregnant, lactating, and have severe diseases. Study coordinator assist participant every time especially when participants have questions.

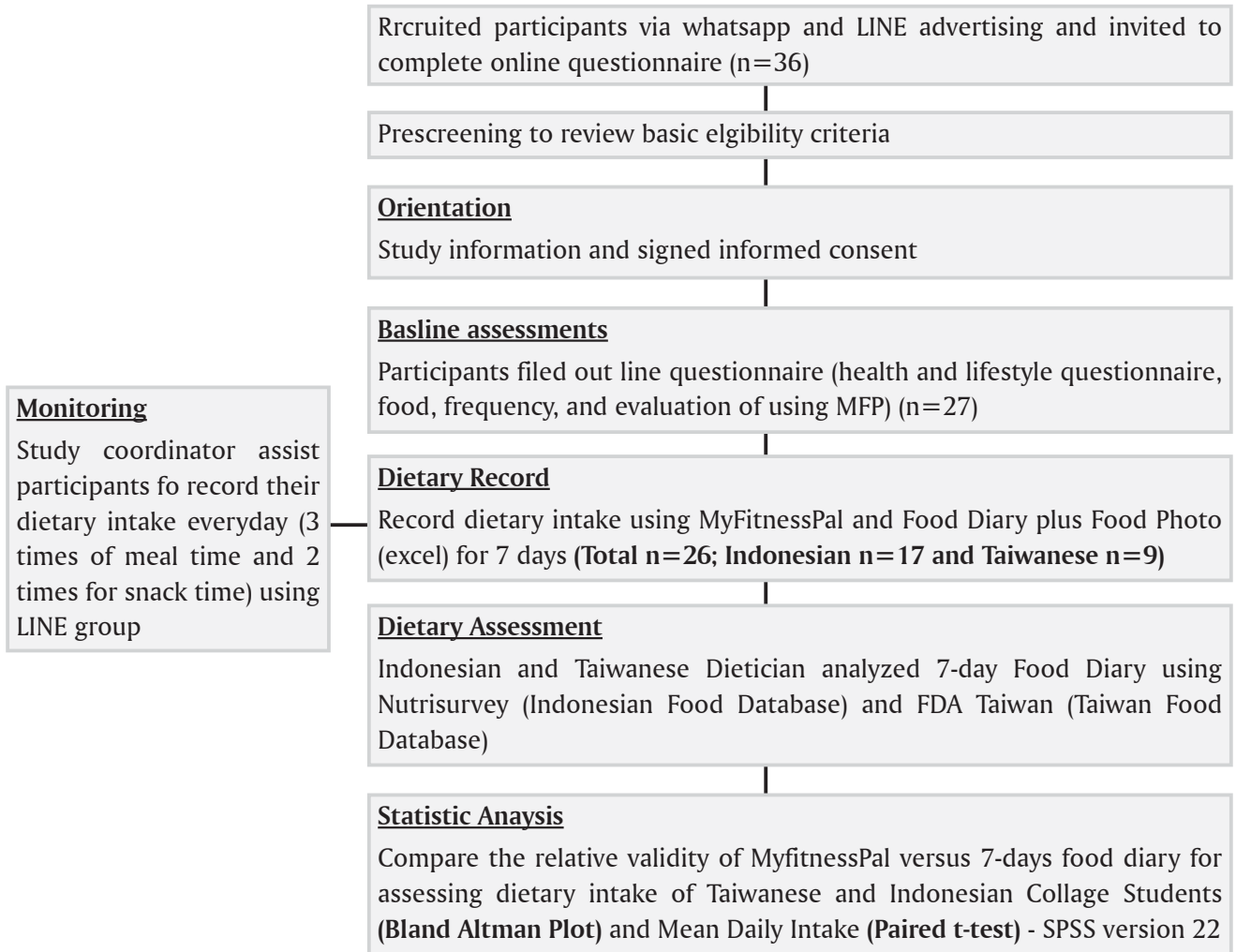


Figure 1. Flow chart

### Demographic and Anthropometric Assessment

Participants were asked to complete an online questionnaire on demographics and also report body weight (Kg), height (cm), and waist circumference. Records consisted of measurement results of the scales.

### MyFitnessPal Dietary assessment

Study coordinator give the detailed instruction about how to record dietary intake using Myfitnesspal (MFP) and 7-day food dairy, take picture for food, filled out online questionnaire (google form).

Participants record dietary intake within 7 days using both MFP and 7-day food record. Study coordinator reminded participants in every meal time using LINE and Whatsapp group. Participants submit their report every day to study coordinator using LINE and participants will submit complete dietary record in the end of study using excel.



Figure 2. Dietary assessment by 24-h food records

## RESULT AND DISCUSSION

### Characteristics of study participants

Nine participants did not record any data for the 7-day period because limited access of internet and have a busy work. For the food record conducted during 7 days, one participant was excluded from the analysis because the data is not complete. Of a possible 189d of entry (twenty-seven people multiply by 7d recording), 182 entries were eligible for analysis. Indonesian participants tend to use app in Indonesia and English setting and Taiwanese participants prefer use Chinese. MFP provide language and food database in English, Indonesian, and Chinese. Participants easy to find food based on their dietary habit on MFP. Furthermore, Barcode scanner features on MFP is very convenience for participants to record many foods quickly and easily.

Table 1. Characteristics of the study participants (n=26)

Characteristics of Participants	n=26	
	n	%
<b>Gender</b>		
Male	4	15.4
Female	22	84.6
<b>Marital Status</b>		
Married	1	3.8
Not Married	25	96.2
<b>Major</b>		
Health related fields	22	84.6
Non health related fields	4	15.4
<b>Body Mass Index (Kg/m<sup>2</sup>)</b>		

Underweight (<18.5 kg/m <sup>2</sup> )	3	11.5
Normal (18.5-<23 kg/m <sup>2</sup> )	17	65.4
Overweight (23-<27.5 kg/m <sup>2</sup> )	5	19.2
Obese (≥27.5 Kg/m <sup>2</sup> )	1	3.8

### Abdominal Obesity (Male ≥90cm, Female ≥80cm)

Yes	6	23.1
No	20	76.9

### Ethnicity

Indonesian	17	65.4
Taiwanese	9	34.6

### Smartphone type

Android	20	76.9
iOS	6	23.1

### The language setting on the smartphone

English	11	42.3
Indonesia	6	23.1
Chinese	9	34.6

### Accuracy of MyfitnessPal compared with 7-day Food Record (FR)

Participants tend to use MFP if they have enough time to record dietary intake. On weekend, participants have difficulty to record dietary intake because some of them ate of lunch or dinner at the restaurant with their friend or relation. Table 2 shows the daily intake of energy (kcal), protein (g), carbohydrate (g), fat (g), fiber (g), cholesterol (g), and sodium (mg) which is recorded by MFP and 7-day food record for the equivalent day.

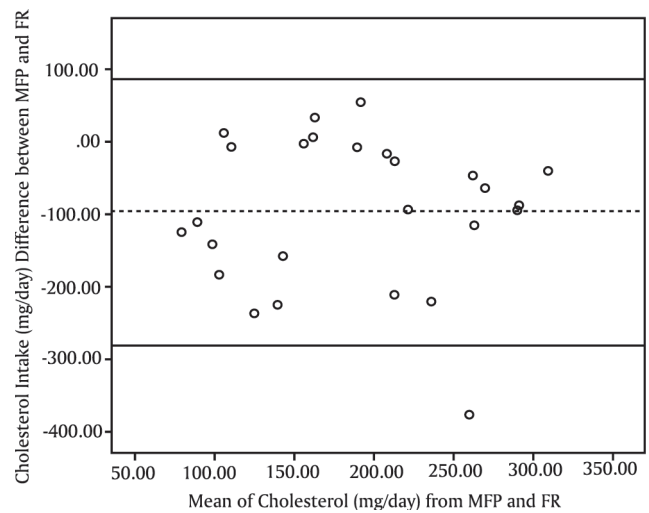
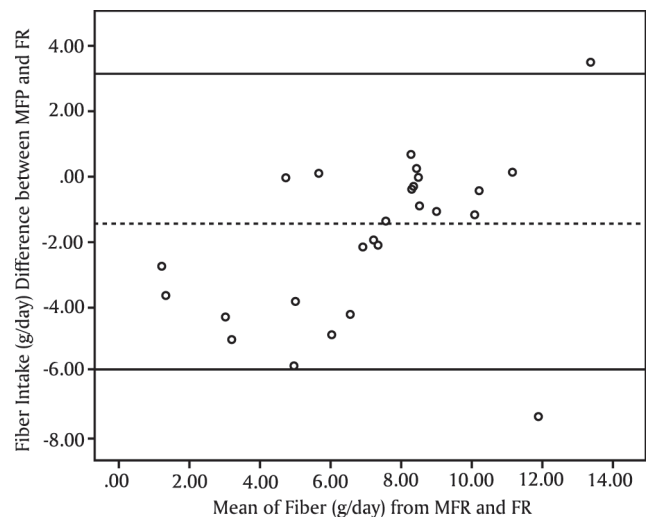
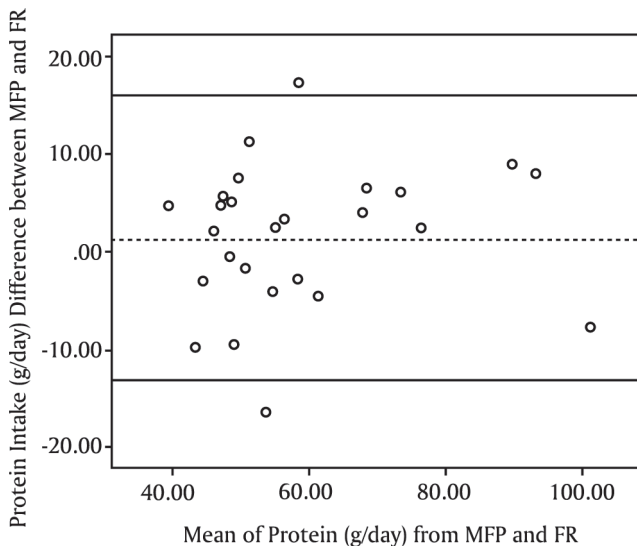
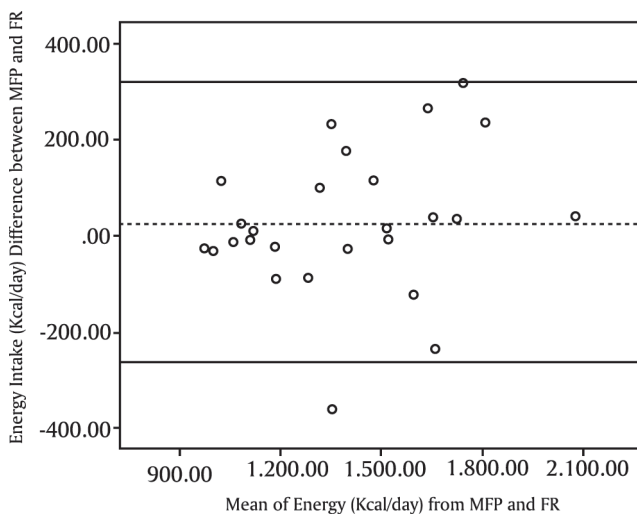
Table 2. Statistical agreement mean intake between MFP and 7-day food record

Nutrients	MyfitnessPal Mean (SD)	7-Day Food Record Mean (SD)	Mean Difference (SD)	95%CI	p-Value	Correlation between MFP and 7-day Food Record		
						r	95% CI	P
Calorie (Kcal/day)	1408.3 (314.1)	1381.6 (280.4)	26.6 (148.7)	-33.4, 86.7	0.370 <sup>a</sup>	0.881	0.6, 1.0	0.000 <sup>bc</sup>
Protein (g/day)	55.6 (15.9)	53.3 (15.0)	2.2 (7.0)	-0.6, 5.1	0.078 <sup>b</sup>	0.899	0.8, 1.1	0.000 <sup>bc</sup>
Carbohydrate (g/day)	182.5 (50.7)	154.6 (64.2)	27.9 (74.9)	-2.4, 58.1	0.069 <sup>a</sup>	0.168	-0.2, 0.5	0.413 <sup>c</sup>
Fat (g/day)	46.9 (10.3)	48.0 (14.7)	-1.1 (14.6)	-7.0, 4.8	0.704 <sup>a</sup>	0.358	-0.0, 0.5	0.072 <sup>c</sup>
Fiber (g/day)	7.3 (3.9)	8.6 (2.8)	-1.3 (2.4)	-2.3, -0.3	0.022 <sup>sb</sup>	0.778	0.7, 1.4	0.000 <sup>bc</sup>
Cholesterol (mg/day)	137.2 (84.0)	233.9 (85.2)	-96.7 (94.8)	-135.0, -58.4	0.000 <sup>sa</sup>	0.372	-0.0, 0.8	0.061 <sup>c</sup>
Sodium (mg/day)	992.6 (573.0)	888.8 (740.6)	103.7 (579.3)	-130.3, 337.7	0.328 <sup>b</sup>	0.638	0.2, 0.7	0.000 <sup>bc</sup>

All data normally distributed: <sup>a</sup>paired t-test, abnormal data distributed: <sup>b</sup>Wilcoxon, <sup>c</sup>Linear regression

All outcome variables excluding fiber ( $p=0.022$ ) and cholesterol ( $p=0.000$ ) met the assumption of normality ( $p>0.05$ ). As the outcome data were found to be normally distributed were analyzed using parametric paired t-test, which show no statistically difference between the mean daily energy intake on energy, macronutrients (protein, carbohydrate, fat) and sodium recorded between MFP and 7-day food record. Other nutrients were analyzed using non-parametric Wilcoxon paired t-test. But, for fiber and cholesterol, there were a statistically difference between MFP and food record.

Repeated measures Bland-Altman plots showed good agreement for both methods. These finding showed that among Indonesian and Taiwanese, there was a non-significant difference in energy, macronutrients (protein, carbohydrate, fat) and sodium intake between the two methods. Moreover, some nutrients such as fiber and cholesterol found a significant difference between MFP and 7d food record.



**Figure 3. Agreement of energy intake between MFP and FR using Bland-Altman plot**

This figure show mean difference (MFP-FR, dotted lines) vs. mean intakes  $((MFP+FR)/2)$  between MFP and FR and two standard deviations of the difference (limit of agreement, solid lines), for the following: (a) Calorie (Kcal/day); (b) Protein (grams/day); (c) Fat (grams/day); (d) Carbohydrate (grams/day); (e) Fiber (grams/day); (f) Cholesterol (mg/day).

## CONCLUSIONS AND RECOMENDATION

This study showed that Indonesian college students and Taiwanese college students convenience in using MFP. MFP has a variety food database, not only western foods database but also local foods from Indonesia and Taiwan. MFP showed good relative validity, especially for energy, macronutrients (protein, carbohydrate, fat) and sodium intake. Therefore, MFP was a useful tool as an alternative to evaluate daily food intake, particularly for Asian people.



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