Validity and reliability of a Two-Minute Assessment rapid dietary questionnaire measuring healthy eating behaviours among Hong Kong primary school students

GS Guldan *, TS Lau, HM Lee

KEY MESSAGES

1. The Two-Minute Assessment (TMA) had good reliability and validity in assessing primary school students' dietary intakes, such as calcium, dietary fibre, carbonated drinks, milk or soy milk, fruits, and vegetables.
2. The TMA can be self-administered and reviewed quickly, and therefore can be used to detect imbalanced diets and unhealthy lifestyles among Hong Kong primary school students for counselling and group-level healthy eating behaviour measurement.

Hong Kong Med J 2014;20(Suppl 7):S30-3
HHSRF project number: 06070431

[1] **GS Guldan *, [2] TS Lau, [1] HM Lee**

The Chinese University of Hong Kong:
[1] *Department of Biochemistry*
[2] *Department of Statistics*

* Principal applicant and corresponding author: georgia.guldan@auw.edu.bd

Introduction

Poor dietary intake is one of the causes of obesity. Children nowadays consume more energy-dense foods, foods away from home, commercially prepared or processed foods, but less fruits and vegetables, and often skip breakfast.[1,2] To correct dietary imbalances, dietary assessment is needed to design effective interventions. However, common dietary assessment methods, such as food records and 24-hour dietary recall, are not feasible in schools, communities, and most clinical settings, owing to their time-consuming, labour-intensive, and expensive nature. Therefore, a rapid, reliable, and valid assessment tool should be developed. This study aimed to test the reliability and validity of a Two-Minute Assessment (TMA) among Hong Kong primary school students.

Methods

This study was conducted from September 2008 to July 2009 to examine the reliability and validity of a rapid dietary assessment tool—the TMA—in assessing eating behaviours and dietary intake of 391 primary five (P5) and six (P6) students (54.0% boys; 51.7% P5) from four schools. Students' dietary intake data were analysed using Nutrition Data System for Research software version 2007, and students' average daily nutrient and food group intakes were obtained.

The reliability of the draft TMA was assessed among 1301 P5 and P6 students (mean±standard deviation [SD] age, 11.6±0.7 years) [54.1% boys; 48.7% P5] who completed both first and second TMAs over a 2-week test-retest period using Kappa statistics and percent agreement, with 75% as the cut-off indicating agreement. The validity of the draft TMA was assessed for the 357 students (mean±SD age, 11.5±0.6 years) [54.6% boys; 51.5% P5] who completed both first and second TMAs and the 24-hour dietary recalls. The validity of the rapid assessment tool binary diet behavioural items at the first TMA administration was assessed relative to the quantitative food and nutrient intakes revealed in the 3 days of 24-hour dietary recall interviews to find if specific dietary behaviours were correlated with the food and/or nutrient intakes and behaviours reported from the 24-hour dietary recall interviews.

Results

The percent agreement of the TMA eating behaviour questions ranged from 72.9% to 90.8% (Table 1). The percent agreement exceeded 75% for 16 out of the 17 questions. The question regarding the consumption of sugar-added non-carbonated drinks had a percent agreement of 72.9%. Test-retest Kappa values of the 17 questions were fair to substantial based on the Landis and Koch scale, with 88% of the questions having Kappa values of >0.41, which is defined as moderately reliable.

Eating behaviour questions regarding the consumption of daily breakfast, candies or chocolates, carbonated drinks, milk or soy milk, fruits and vegetables, deep fried foods, white or whole wheat bread, and meats with visible fat or poultry with skin

TABLE 1. Reliability of the Two-Minute Assessment questions

Question	% Agreement	Kappa value (95% CI)
Daily eating pattern		
I have breakfast every day	90.81	0.750 (0.707-0.793)
I have more than three meals and two snacks per day	76.55	0.449 (0.395-0.503)
I eat the following foods daily, or almost as often:		
>2 cookies	84.00	0.427 (0.355-0.499)
Sweet cakes or crème cakes	89.02	0.274 (0.160-0.387)
Instant noodles	83.48	0.496 (0.433-0.558)
Candies, chocolates	77.21	0.500 (0.449-0.550)
Potato or other crisps	82.37	0.463 (0.399-0.526)
Carbonated drinks (cola, etc.)	80.02	0.483 (0.426-0.539)
Sugar-added non-carbonated drinks (lemon tea, milk tea, soy milk, etc)	72.94	0.493 (0.389-0.590)
I drink >1 glass of fruit juice per day	77.49	0.366 (0.302-0.431)
I drink 1 glass of milk or soy milk per day	78.33	0.567 (0.522-0.612)
I eat ≥2 fruits every day (apple/orange size)	78.74	0.552 (0.505-0.599)
I eat ≥2 rice bowls of vegetables every day	76.73	0.534 (0.488-0.580)
Weekly eating/lifestyle pattern		
I eat deep fried food (French fries, fried chicken, spring rolls, etc) more than twice per week	76.91	0.412 (0.352-0.471)
I eat fast food from a restaurant more than twice per week	84.12	0.463 (0.366-0.507)
I eat only white bread, and never eat whole wheat bread	75.90	0.460 (0.407-0.512)
I eat meats with visible fat, or poultry with skin more than three times a week	86.14	0.472 (0.401-0.544)

showed expected associations with the students' dietary behaviours and also their dietary intakes of specific food items and selected nutrients (Table 2). However, four TMA items concerning students' daily consumption of cookies, sweet or crème cakes, potato or other crisps, and fruit juice were invalid in assessing students' intakes of any nutrient, food group, or specific food item intakes. Some gender differences but not grade differences were noted in the validity of the TMA.

Discussion

Both the prevalence of a particular behaviour and question wording may affect the reliability estimates of the TMA. For example, the prevalence of consumption of instant noodles and sugar-added non-carbonated drinks from the 24-hour dietary recalls suggested that more students never or seldom eat instant noodles (prevalence of consumption, 41.7%), compared to their more frequent consumption of sugar-added non-carbonated drinks (prevalence of consumption, 77.3%). Therefore, these students were more likely to recall their instant noodle consumption than they were for sugar-added non-carbonated drinks, and higher reliability was obtained for instant noodle consumption than for sugar-added non-carbonated drinks. This finding is in keeping with that in another study.[3]

The wording of the questions may also affect reliability estimates. For example, even though the TMA questionnaire was pre-tested and examples were given during administration, the terms 'sugar-added non-carbonated drinks', 'sweet or crème cakes', and 'fruit juice' might still have been ambiguous or cognitively less clear to some students. For example, sugar-added non-carbonated drinks cover a wide variety of drinks (such as teas, fruit drinks, and soy milk) yet exclude carbonated beverages. Students might have had different understandings of the term at the two administrations, and might have had difficulty in categorising these two food items. This may explain the relatively low (72.9%) percent agreement obtained.

The overall TMA validity was good for both genders. However, gender differences were noted, as boys and girls differed in some dietary practices. No validity difference was observed between students in different grades, suggesting that the TMA validity was similar for both groups of students.

The questions with foods that were clearly defined and eaten more frequently, such as vegetables, milk or soy milk, showed better validity than others that were less clearly understood and/or eaten less frequently. Specific actionable feedback can be given for those less healthy behaviours. However, four dietary behavioural questions regarding students'

TABLE 2. Associations between each question and students' dietary behaviours and intakes

Question	Association between each question and students' dietary behaviours and intakes
Has daily breakfast	1. Students who reported this behaviour had daily breakfast habit in 24-hour dietary recalls (86.4% vs 13.6%, P<0.001) 2. Students who reported this behaviour met the minimum grain and cereal (31.8% vs 18.3%, P=0.028) and vegetable (47.9% vs 33.8%, P=0.034) intake recommendations 3. Students who reported this behaviour exceeded the maximum cholesterol (41.6% vs 26.8%, P=0.029) and meat and meat alternative (58.4% vs 38.0%, P=0.002) intake limits 4. Boys who reported this behaviour had higher intakes of energy, total fat, saturated fatty acids (SFA), carbohydrates, protein, cholesterol, dietary fibre, vitamin D, calcium, iron, grains and cereals, fruits and vegetables (data not shown) 5. Boys who reported this behaviour had higher intakes of sodium and meat and meat alternatives (data not shown) 6. Girls who reported this behaviour had higher intake of grains and cereals (data not shown)
Has >3 meals and 2 snacks daily	Boys who reported this behaviour (n=63, 32.3%) had lower daily vegetable intakes (3.28±1.96 taels vs 4.12±2.47 taels, P=0.019)
Eats >2 cookies daily	No association found
Eats sweet/crème cakes daily	No association found
Eats instant noodles daily	1. 19.0% of students who reported this behaviour were less likely to exceed the cholesterol intake limit (27.9% vs 41.6%, P=0.039) 2. Students who reported this behaviour were also less likely to meet the minimum dietary fibre intake recommendations (4.4% vs 16.8%, P=0.007), and minimum vegetable intake recommendations (36.7% vs 50.9%, P=0.009) 3. Boys who reported this behaviour consumed less fat, cholesterol, sodium, carbohydrates, protein, dietary fibre, grains and cereals, and vegetables (data not shown)
Eats candies/chocolates daily	Girls who reported this behaviour (n=60, 37.0%) consumed more candies or chocolates (4.12±9.27 g vs 1.58±4.37 g, P=0.050)
Eats potato/other crisps daily	No association found
Drinks carbonated drinks daily	1. Students who reported this behaviour consumed more carbonated drinks (boys: 100.40±122.36 ml vs 45.83±80.95 ml, P=0.006; girls: 88.97±103.52 ml vs 46.97±92.42 ml, P=0.011) 2. Students who reported this behaviour were less likely to meet the recommendations for dietary fibre (6.9% vs 16.5%, P=0.040), fruits (37.5% vs 51.3%, P=0.047), and vegetables (34.7% vs 48.4%, P=0.046)
Drinks sugar-added non-carbonated drinks daily	Students who reported this behaviour failed to meet the recommendations for dietary fibre (10.7% vs 20.7%, P=0.013) and vegetable (40.0% vs 53.6%, P=0.016) intake
Drinks >1 glass of fruit juice daily	No association found
Drinks 1 glass of milk/soy milk daily	1. Students who reported this behaviour consumed more milk (boys: 106.87±110.66 ml vs 48.45±69.52 ml, P<0.001, girls: 102.19±103.11 ml vs 63.32±88.37 ml, P=0.012) and soy milk (boys: 50.75±87.40 ml vs 31.91±59.00 ml, P=0.076; girls: 60.40±113.34 ml vs 17.70±47.05 ml, P=0.002) 2. Students who reported this behaviour had higher absolute calcium intakes (boys: 536.36±205.75 mg vs 469.65±208.74 mg, P=0.026; girls: 538.29±197.72 mg vs 465.46±184.90 mg, P=0.018) 3. Students who reported this behaviour were more likely to have >30% of calories from fat (45.9% vs 35.0%, P=0.040) and >10% of calories from SFA (28.4% vs 15.3%, P=0.003)
Eats 2 or more servings of fruits daily	1. Students who reported this behaviour were more likely to meet the recommendations for fruit (59.5% vs 30.7%, P<0.001) and vegetable (53.6% vs 31.4%, P<0.001) intake, and to have higher dietary fibre and fruit intakes (data not shown) 2. Students who reported this behaviour were less likely to exceed the recommendations for energy from SFA (18.2% vs 29.2%, P=0.019), trans fat (62.3% vs 74.5%, P=0.021), and fat (36.8% vs 47.4%, P=0.060)
Eats 2 or more rice bowls of vegetables daily	Students who reported this behaviour met the vegetable intake recommendation (54.4% vs 34.5%, P<0.001)
Eats deep fried food >2x/week	1. Students who reported this behaviour showed trends to be more likely to exceed the maximum energy recommendations from fat (49.4% vs 38.1%, P=0.076) and trans fat (75.3% vs 64.2%, P=0.064) 2. Students who reported this behaviour were less likely to meet the vegetable intake recommendations (31.8% vs 49.4%, P=0.006) 3. Boys who reported this behaviour consumed more deep fried foods (25.31±38.62 g vs 12.26±29.71 g, P=0.027)
Eats fast food >2x/week	1. Students who reported this behaviour had ≤300 mg cholesterol intake (22.0% vs 41.9%, P=0.005) 2. Students who reported this behaviour failed to meet minimum vegetable intake recommendations (25.4% vs 49.0%, P=0.001)
Eats only white bread, not whole wheat bread	Boys who reported this behaviour consumed less whole wheat bread (0.51±3.92 g vs 5.02±18.09 g, P=0.006)
Eats meats with visible fat or skin >3x/week	Boys who reported this behaviour consumed more poultry (1.38±1.16 taels vs 1.04±0.86 taels, P=0.035)

consumption of cookies, sweet or crème cakes, potato or other crisps, and fruit juice were not valid in assessing any nutrient, food group, or specific food item intakes. This might have been due to the low prevalence of consumption of these foods, or the small amounts consumed by these students. The prevalence of consumption of these four food items were low, perhaps because of the nutrition policies of the four schools to limit the selling of these unhealthier snacks in their 'tuck shops' and vending machines. The validity of these four questions may have been lower because students may have given more socially desirable responses during the 24-hour dietary recall interviews with parents present, as the students probably recognised that these foods were among the less healthy snacks.

Conclusions

The TMA showed good reliability and validity in assessing students' dietary behaviour and intake. It can be self-administered and reviewed quickly, and therefore can be used to detect imbalanced diets among Hong Kong primary school students for group-level healthy eating behaviour measurement and intervention.

Acknowledgement

This study was supported by the Health and Health Services Research Fund, Food and Health Bureau, Hong Kong SAR Government (#06070431).

References

1. Astrup A, Dyerberg J, Selleck M, Stender S. Nutrition transition and its relationship to the development of obesity and related chronic diseases. Obes Rev 2008;9(Suppl 1):48-52.
2. Roblin L. Childhood obesity: food, nutrient, and eating-habit trends and influences. Appl Physiol Nutr Metab 2007;32:635-45.
3. Speck BJ, Bradley CB, Harrell JS, Belyea MJ. A food frequency questionnaire for youth: psychometric analysis and summary of eating habits in adolescents. J Adolesc Health 2001;28:16-25.