The development, validity and reproducibility of a tool (the Athlete Diet Index Questionnaire) to assess the dietary intake of high performing athletes

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Abstract

Background: Well-chosen eating strategies can enhance an athlete's health and sporting performance. It is important for sports dietitians and nutritionists to have access to accurate and reliable dietary assessment methods. Currently there is no population specific, simple food based dietary index suitable for the examination of diet quality among athletes. This study aimed to develop a diet quality index (the Athlete Diet Index Questionnaire (ADI-Q)) which focusses on the baseline nutrition requirements of high performing New Zealand athletes, and examine the validity and reproducibility of food groups, food variety, fluid consumption and eating habits within the ADI-Q.

Methods: The ADI-Q was developed for high performing athletes and was based on dietary components which reflect the Eating and Activity Guidelines for New Zealand Adults (EAGNZA). Athletes who represented their main sport at a regional level or above volunteered to participate in the study. During the first appointment athletes completed the ADI-Q (ADI-Q#1) and an estimated four-day food record (4DFR) (to assess relative validity). The test-retest reliability of ADI-Q#1 was assessed by a second administration of the ADI-Q (ADI-Q#2) four-weeks later. Both relative validity and reliability were assessed using paired-t tests, Pearson's correlation coefficients, Chi square analysis and Bland-Altman plots.

Results: Sixty-eight athletes (26 males, 43 females, 16-71 years) involved in more than 30 different sports completed the study. When assessing relative validity paired t-tests showed good agreement between servings of dried fruit/fruit juice, starchy vegetables, milk and/or milk alternatives, lean meat (beef, lamb, pork) and times treat food were consumed ($p>0.05$). Food groups found to be significantly different tended to have a lower mean number of servings for the ADI-Q#1 compared with 4DFR. Correlation coefficients ranged from 0.19 (servings of starchy vegetables) ($p>0.05$) to 0.66 (servings of non-starchy vegetables) ($p<0.05$) with an average correlation of 0.42. Variety of fruit and vegetables had an average correlation of 0.52. The majority of fluid components had good agreement with only servings of milk and/or milk alternatives and soft drinks/fizzy drinks/carbonated water found to be significantly different ($p<0.05$). Correlation coefficients ranged from -0.03 (flavoured water/sports water and coconut water) ($p>0.05$) to 0.77 (herbal tea) ($p<0.05$) with an average correlation of 0.39. Healthy versus less healthy options showed poor agreement between the ADI-Q#1 and the 4DFR with all components except the use of unsaturated fat being significantly different ($p<0.05$). Meal frequency showed good agreement with only consumption of

morning tea found to be significantly different between methods ($p<0.05$). When assessing reproducibility, there was no significant difference found between most dietary components with the exception of servings of non-starchy vegetables, breads and cereals, meat alternatives, water and times takeaways were consumed ($p<0.05$). Significantly different food groups and fluids had a higher mean number of servings/times from ADI-Q#1 compared with ADI-Q#2. Correlation coefficients for food groups ranged from 0.18 (servings of lean meat) ($p>0.05$) to 0.63 (servings of starchy vegetables) ($p<0.05$) with an average correlation of 0.46. Variety of fruit and vegetables had an average correlation of 0.56. The correlation coefficients for fluid consumption ranged from -0.02 (servings of flavoured water/sports water) ($p>0.05$) to 0.91 (servings of coffee) ($p<0.05$) with an average correlation of 0.52. There was no significant difference between healthy versus less healthy options and meal frequency between the first and second administration of the ADI-Q.

Conclusions: The ADI-Q showed reasonable validity for the majority of dietary components when compared with a 4DFR. Reproducibility of the ADI-Q was moderate to high for majority of the dietary components. Further development of the ADI-Q and index score to assess diet quality may help to improve the analysis of dietary intake among high performing athletes.

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Abbreviation List

24hDR	Twenty-four-hour diet records
4DFR	Four-day food record
ADI-Q	Athlete Diet Index Questionnaire
ADI-Q#1	Athlete Diet Index Questionnaire appointment one
ADI-Q#2	Athlete Diet Index Questionnaire appointment two
AHEI	Australian Healthy Eating Index for Australian Adults
AI	Adequate Intake
ARFS	Australian Recommended Food Score
ARFS-P	Australian Recommended Food Score for Pre-schoolers
Aussie-DQI	Aussie Diet Quality Index
BCAAs	Branched chain amino acids
BMI	Body mass index
BW	Body weight
CHO	Carbohydrate
CVD	Cardiovascular disease
d	Day
DGI	Australian Diet Guideline Index
DLW	Doubly labelled water technique
DQI	Diet Quality Index
DQI-I	Diet Quality Index International
DQI-R	Diet Quality Index Revised
DQT	Diet Quality Tool

DR	Diet record
EAGNZA	Eating and Activity Guidelines for New Zealand Adults
FFQ	Food frequency questionnaire
FR	Food record
FUQ	Food use questionnaire
FQ	Food questionnaire
h	Hour
HEI	Healthy Eating Index
HEIFA	Healthy Eating Index for Australian Adults
HDI	Healthy Diet Indicator
IGF-1	Insulin-like growth factor 1
LOA	Limits of agreement
MDS	Mediterranean Score
MOH	Ministry of Health
MUFA	Monounsaturated fatty acids
MUHNRC	Massey University Human Nutrition Research Centre
NZDQI-A	New Zealand Diet Quality Index for Adolescents
NRV	Nutrient Reference Values
PUFA	Polyunsaturated fatty acids
RDI	Recommended Dietary Intake
SD	Standard deviation
SFA	Saturated fatty acids
T3	Triiodothyronine

VSSR	Virtual Self-Service Restaurant
y	Year