

### Introduction

Good nutrition is a basic component of athletic performance. Nutrition provides energy, enables recovery and shapes the body composition. Knowledge about nutrition is fundamental to healthy eating, even before it becomes a habit through extensive repetition. Sports dietitians are the key personnel who deliver such knowledge to athletes. The Hong Kong Sports Institute (HKSI) uses many strategies to deliver knowledge and messages about nutrition. Therefore, it would be interesting to determine how much knowledge is retained by the athletes. Hence, this study was conducted to investigate the nutrition knowledge level among athletes in Hong Kong and identify the areas of sports nutrition in which knowledge is lacking.

### Methodology

To test the athletes' level of nutrition knowledge, we created our own questionnaire. This questionnaire was created based on a nutrition syllabus, using reference from several papers [1-3] and the input from four sports nutritionists. Our syllabus focused on 10 specific sports nutrition topics, as shown in Table 1. We aimed to create a questionnaire that could be administered easily to measure the level of nutrition knowledge among athletes in Hong Kong.

The questionnaire consisted of 10 questions in multiple-choice format, each of which addressed one nutrition topic (Table 1).

Athletes were invited to complete the questionnaire when they visited the Sport Nutrition Monitoring Centre for an annual physical examination. To facilitate administration, both hard and soft copies of the questionnaire were prepared; the soft copy was easily accessible via a URL link or QR code. Participation in the survey was voluntary. Athletes who were mentally handicapped were excluded.

### Results

A total of 166 responses to the questionnaire were collected during January to March 2019. Four responses were excluded because the questions were not completely answered. Therefore, 162 valid responses were analysed.

Table 2 shows the percentages of respondents who answered each question correctly. The average total score was 67%. The three lowest scoring questions addressed fat (30.9%), protein (38.3%) and hydration (45.1%) for sports performance. The three highest scoring questions addressed strategies for eating out (96.3%), the pre-training diet (95.7%) and food labels (94.4%).

Twenty-four percent of the respondents reported that they had completed nutrition education workshops, whereas the others reported either that they had not attended or had just started attending such workshops (Table 3).

The respondents were athletes from 24 different sports. Their characteristics are listed in Table 3. The ages of the respondents ranged from 12 to 55 years. Most of the respondents were between the ages of 18 and 20 years, and 60% were male.

Table 2 also presents the percentages of correct answers to each question according to whether the respondent had attended nutrition education workshops. Those who attended such workshops had a significantly higher average score on the hydration question than those who did not attend such workshops (66.7% vs 38.2%,  $p = 0.001$ ). Respondents who attended workshops had a higher total score than those who did not attend (69.2% vs 65.9%), although this difference did not reach statistical significance ( $p = 0.1223$ ).

### Discussion

In this study, the respondents received an average score of 67% on our questionnaire, which corresponds to a satisfactory level of sport nutrition knowledge. According to Havermale, a cut-off score of 60% is considered to

indicate adequate nutrition knowledge.<sup>[1]</sup> Other studies have reported average nutrition knowledge scores ranging from 43% to 69%.<sup>[4-8]</sup> However, different studies have used different questionnaires, and not all have been validated. As only 25% of the respondents in our study reported that they had completed the 10-session nutrition education workshops, there appears to be room for further improvements in the respondents' nutrition knowledge scores.

We were unable to establish a statistically significant difference in the test nutrition scores between those who did and did not attend nutrition education workshops (69.2% vs 65.9%;  $p = 0.1223$ ). The very small sample of respondents who attended workshops (24%) may have affected the statistical comparison. Additionally, we did not consider other avenues where athletes could have received nutrition knowledge, such as sports nutrition infographics, nutrition consultations and dietitians' communications with athletes during on-field support. These are possible confounding factors that may limit our study. However, our results suggest that additional education is needed in the weaker areas of sports nutrition, including the value of fat, protein and hydration for sports performance.

Moving forward, advancing this study to a research project would enable us to transform our questionnaire into a validated and meaningful tool that would more certainly provide a truer reflection of athletes' nutrition knowledge levels. Such a tool for effectively assessing athletes' nutrition knowledge levels would be a valuable contribution to the sports nutrition field.

### Conclusion

In general, elite athletes in Hong Kong have adequate knowledge about nutrition, although knowledge may be lacking in areas such as the importance of fat, protein and hydration for sports performance. In the future, the nutrition workshop should be more focus in these areas. Moreover, nutrition education workshop can be one of the important avenues to disseminate correct nutrition information to athletes.

**Table 1. The educational contents listed on the syllabus and the corresponding test questions.**

Topic	Test question [multiple choice]
1 The importance of a balanced diet	Which of the following food groups should be included in a balanced diet for athletes?
2 Carbohydrates for sports performance	Why are carbohydrates very important for athletes?
3 Fat intake for sports performance	If an athlete wants to eat healthier, which option is wrong?
4 Protein intake for sports performance	For most athletes, how much lean meat should be eaten in the main meal?
5 Eating before and after training and competition	Why is it so important to eat after intense training or a competition?
6 Hydration and fluid replacement	How much fluid does an athlete need to drink?
7 Assess your own diet	Which dietary habits should an athlete have?
8 How to read food labels	Why do athletes need to know how to read nutrition labels?
9 Strategies for dining out at home and abroad	What kind of foods should be brought overseas for competition or training?
10 Sports supplement use for performance	Which pyramid is correct? [responses are images of four pyramids]

**Table 2. Percentages of correct answers to the survey questions according to workshop attendance, from lowest to highest**

Topic	Attended workshop (n = 39)	Did not attend workshop (n = 123)	p-value	Overall (n=162)
3 [Fat]	28.2%	31.7%	0.3396	30.9%
4 [Protein]	41.0%	37.4%	0.3458	38.3%
6 [Hydration]	66.7%	38.2%	0.0010	45.1%
1 [Balanced diet]	56.4%	46.3%	0.1396	48.8%
10 [Supplements]	59.0%	65.9%	0.2253	64.2%
7 [Assessing diet]	69.2%	67.5%	0.4197	67.9%
2 [Carbohydrate]	84.6%	85.4%	0.4554	85.2%
8 [Food labels]	94.9%	94.3%	0.4462	94.4%
5 [Pre-training eating]	97.4%	95.1%	0.2373	95.7%
9 [Eating out strategies]	94.9%	96.7%	0.3172	96.3%
Total Average	69.2%	65.9%	0.1223	66.7%

**Table 3. Characteristics of the respondents**

Sports	Number of athletes (%)	Sports	Number of athletes (%)	Sports	Number of athletes (%)
Athletics	3 (2%)	Karatedo	5 (3%)	Swimming	16 (10%)
Badminton	16 (10%)	Mountaineering	1 (1%)	Table Tennis	8 (5%)
Billiard	5 (3%)	Rowing	15 (9%)	Taekwondo	1 (1%)
Boccia	1 (1%)	Rugby	21 (13%)	Tennis	3 (2%)
Canoe	4 (2%)	Sailing	4 (2%)	Tenpin Bowling	7 (4%)
Cycling	9 (6%)	SAPD Badminton	2 (1%)	Triathlon	10 (6%)
Gymnastics	5 (3%)	Skating	3 (2%)	Windsurfing	7 (4%)
Judo	1 (1%)	Squash	6 (4%)	Wushu	9 (5%)
		Total	162 (100%)		
Gender	Number of athletes (%)	Age (years)	Number of athletes (%)	Attended nutrition education workshops	Number of athletes (%)
Male	98 (60%)	12-19	70 (43%)	Yes	39 (24%)
Female	64 (40%)	20-29	77 (48%)	No	123 (76%)
		≥30	15 (9%)		
Total	162 (100%)	Total	162 (100%)	Total	162 (100%)

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