HONG KONG SPORTS INSTITUTE
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RESEARCH HIGHLIGHTS

Hong Kong Elite Athletes' Beliefs, Knowledge about and Practice of Recovery Nutrition

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Introduction

Recovery nutrition has been widely researched and discussed due to the significant relationship between dietary intake and optimal sport performance. As appropriate dietary intake post-exercise can replenish stores of endogenous substrates, facilitate muscle reconditioning and repair of muscle damage, nutritional strategies have been used to aid with training adaptation and recovery [1]. Elite athletes at the Hong Kong Sports Institute (HKSI) perform up to three training sessions per training day and their recovery period between training sessions varies from a few hours to 24 hours. Thus, it is important for these athletes to consume adequate and suitable nutrients after training sessions to support their physiological needs and enable them to progressively improve their sports performance [2]. Moreover, sports dietitians must ensure that these athletes have a sufficient intake of key nutrients such as carbohydrates and proteins, while maintaining their hydration status to support their recovery and maximize their athletic performance. However, it has been found that athletes might not be consuming sufficient and appropriate food or supplements to meet their recovery needs [3,4].

Therefore, a thorough evaluation should be conducted to investigate the level of support currently provided by HKSI to the athletes. By examining how much the athletes understand about recovery nutrition and whether the HKSI provides an environment in which the athletes can 'preach what dietitians teach', HKSI can possibly improve the service provided to athletes in the near future. Accordingly, this study aimed to understand HKSI elite athletes' current beliefs and knowledge about recovery nutrition and how they apply them in real life, which will be the cornerstones for the development of future nutrition-intervention strategies.

Methodology

A literature review of studies was performed on key topics related to recovery nutrition and similar studies that have been conducted at overseas sports institutes or academies. To the best of our knowledge, there is no validated questionnaire on recovery nutrition for elite athletes; the only questionnaire found was in a study of tennis players [5]. Thus, this questionnaire was modified based on the findings of other studies [2,3,5-13]. Specifically, in December 2022, the dietitians of the Sports Nutrition Monitoring Centre (SNMC) used the SurveyMonkey platform to design an online questionnaire, which was then reviewed by one sports dietitian and three other sports-science professionals without a background in nutrition. The questionnaire was divided into three sections, which assessed an athlete's beliefs about recovery nutrition, knowledge about recovery nutrition, and current practice of recovery nutrition, respectively. The 'beliefs' section consisted of two Likert-scale questions. The section evaluating athletes' knowledge was composed of six multiple-choice questions. As knowledge levels are strongly associated with athletes' actual nutrition intake [6], this section mainly focused on nutritional knowledge such as carbohydrate and protein intake, the timing of this intake, and the use of supplements [2,5,7,8]. There was also an additional question about where the athletes learn such knowledge from to better understand the source of nutritional knowledge. The section about application of nutritional knowledge consisted of two Likert-scale questions and four checkbox questions. In addition, the age group, gender, and specialty sport and experience of the respondents were obtained for analytical purposes. All of the data were collected anonymously. The quick response code and website of the online questionnaire were delivered to sports teams and posted in noticeable area of the SNMC. Participation was voluntary and informed consent was required. The questionnaire could be completed anywhere and at any time.

A chi-square analysis with statistical significance defined as $\alpha \leq 0.05$ was used for comparing the ratings of 'perceived importance of nutrition' and 'confidence in selecting appropriate recovery food' between respondents grouped in terms of age, gender, and number of years of training in their specialty sport, respectively. One-way analyses of variance with statistical significance defined as $p \leq 0.05$ were used for comparing knowledge scores between groups.

Results

A total of 154 valid responses to the questionnaire were collected for analysis in December 2022. The characteristics of the respondents and distribution of their specialty sports are listed in Table 1 and Table 2. Regarding the respondents 'perceived importance of nutrition', 97.4% indicated that they thought nutrition was moderately, highly, or extremely important. Similarly, regarding their confidence in 'selecting appropriate recovery food', 84.4% indicated that they were moderately, highly, or extremely confident in doing so. There was not a significant association between 'perceived importance of recovery nutrition' and gender ($\chi^2(3) = 3.270$, $p = 0.352$), age ($\chi^2(9) = 7.285$, $p = 0.607$) or years of training ($\chi^2(15) = 18.309$, $p = 0.247$). Similarly, there was not a significant association between 'confidence in selecting appropriate recovery food' and gender ($\chi^2(4) = 6.721$, $p = 0.151$), age ($\chi^2(12) = 14.1$, $p = 0.294$), or years of training ($\chi^2(20) = 28.7$, $p = 0.094$).

(n = 154)	No. of respondents	Proportion (%)
Gender		
Male	87	56%
Female	67	44%
Age (years)		
<18	57	37%
18-19	23	15%
20-29	56	36%
≥30	18	12%
Years of training in specialty sport		
<1	9	6%
1-5	55	36%
6-10	52	34%
11-15	27	18%
16-20	4	3%
>20	7	5%

Table 1. Characteristics of respondents

Sport	No. of athletes	Proportion (%)	Sport	No. of athletes	Proportion (%)
Athletics	5	3.3%	Squash	9	5.8%
Badminton	7	4.6%	Swimming	17	11.0%
Billiard Sports	7	4.6%	Table Tennis	8	5.2%
Fencing	4	2.6%	Tennis	4	2.6%
Gymnastics	8	5.2%	Triathlon	20	13.0%
Karatedo	3	2.0%	Windsurfing	5	3.3%
Rowing	12	7.8%	Wushu	13	8.4%
Rugby	19	12.3%	SAP Sports	7	4.6%
Sailing	6	3.9%			

Table 2. Number of respondents from each sport

There was no significant association between gender and knowledge about recovery nutrition ($p = 0.45$) or any sport and knowledge about recovery nutrition ($p = 0.059$). However, the respondents who were aged 20 to 29 years had higher knowledge scores than those aged younger than 18 years (64.0% vs 52.0%, $p < 0.05$). In addition, the respondents who had received 11 to 15 years of training in their specialty sport had higher knowledge scores than those who had received 1 to 10 years of training in their specialty sport ($p < 0.05$).

The majority of the respondents gave the correct answers to questions on 'nutrients to restore glycogen', 'food with sufficient protein for recovery', 'selecting best food combinations for recovery', and 'appropriate timing for recovery nutrition intake' (Table 3).

However, 35.7% of the respondents selected 'recovery drinks' as the best drinks to consume after exercise, whereas only 34.4% selected 'depends on the athlete's goals and training programme', which is the more appropriate approach.

Only 14.9% of the respondents correctly selected tart cherry juice (TCJ) as the supplement that 'relieves pain, restores strength AND reduces inflammation after exercise'; 22.7% of the respondents selected whey protein and 40% of the respondents were unsure about the correct answer. This is not surprising, as protein drinks are well known by athletes to support recovery [6], whereas fewer athletes may have a deeper understanding of supplements and thus know about the unique benefits of TCJ.

Nutrition topic	No. respondents with correct answer (%)
Food with sufficient protein for recovery	131 (85.1%)
Appropriate timing for recovery nutrition intake	130 (84.4%)
Nutrients to restore glycogen	102 (66.2%)
Selecting best food combination for recovery	85 (55.2%)
Best drink after exercise	53 (34.4%)
Usage of supplements for specific recovery purposes	23 (14.9%)
Overall average	**56.7%**

Table 3. Proportion of correct answers on knowledge about different nutrition topics

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Results (Cont'd)

Interestingly, the majority (70.1%) of the respondent indicated that 'Nutritionists/ dietitians' were their key source of nutritional knowledge (Table 4), which is a higher proportion than in research that has been performed at other sports academies or institutes [5,14]. However, it is similar to the proportion in a study of disabled athletes [8].

Sources	No. of respondents (%)
Nutritionists/dietitians	108 (70.1%)
Coaches	76 (49.4%)
Fellow athletes/friends	72 (46.8%)
Internet	61 (39.6%)

Table 4. Top-four sources of dietary supplement information

Recovery drinks, sports drinks, and water were the three most popular drinks consumed after training, followed by the food group 'Meat & Alternatives'. More than 40% of the respondents selected the above-mentioned items as their post-exercise drink or food. Regarding post-training drinks, there were fewer respondents who favoured dairy (16.2%) or plant-based drinks (11%) than those who favoured recovery drinks (52%), sports drinks (44.2%), or water (52.6%). Only a few respondents did not eat (1.3%) or ate cakes (2%) after training.

The majority (75.5%) of the respondents who regularly trained at the HKSI thought that the food choices provided for post-exercise recovery were moderately, very, or extremely sufficient, whereas only 36.4% of the respondents who did not regularly train at the HKSI thought so. However, the latter respondents comprised only 7.1% of the total number of respondents (Table 5). The majority of the respondents agreed that 'More choices of recovery dishes at breakfast/lunch/dinner' could help them to consume sufficient recovery food (Table 6).

Regarding what food the respondents wished to be added to the foods currently available at snack kiosks and the canteen, grab-and-go food such as 'Natural cereals and nut bars' (51.6%) and 'Snack packs' (51%) were the most popular, followed by 'Western desserts' (47.7%) and 'Sandwiches' (42.5%) (Table 7).

Regarding the mode of education on recovery nutrition, online materials (e.g., posters, videos, or social media posts) were the most popular choice (Table 8).

	Trained at the HKSI	Trained elsewhere
Answer choice	No. of response (%)	No. of response (%)
Moderate, very, or extremely sufficient	108 (75.5%)	4 (36.4%)
Not sufficient or slightly sufficient	35 (24.5%)	7 (63.6%)
Total:	143 (92.9%)	11 (7.1%)

Table 5. Opinions of respondents grouped in terms of training location regarding sufficiency of food choices available at the Hong Kong Sports Institute (HKSI) for post-exercise recovery

Answer choice	No. of respondents (%)
More choices of recovery dishes at breakfast/lunch/dinner	107 (69.5%)
A vending machine that provides appropriate recovery snacks	85 (55.2%)
More choices of recovery snacks/drinks at kiosks	80 (52.0%)
Longer opening hours at kiosks	75 (48.7%)

Table 6. Respondents' opinions on what would help them to consume sufficient recovery food at the Hong Kong Sports Institute

Answer choice	No. of respondents (%)
Natural cereal and nut bars	80 (52.0%)
Snack packs, such as nuts and dried fruit packs	79 (51.3%)
More types of nutritious Western desserts	73 (47.4%)
Sandwiches	65 (42.2%)
More types of nutritious soups	52 (33.8%)
More types of nutritious Chinese desserts	50 (32.5%)
Other	9 (5.8%)

Table 7. Types of recovery snacks that respondents wished to be provided in future at kiosks / the canteen at the Hong Kong Sports Institute

Answer choice	No. of respondents (%)
Online materials (e.g., posters, videos, or social media posts) that provide information on recovery nutrition	76 (49.4%)
Food models displayed in the canteen illustrating proper choices and portions	59 (38.3%)
A workshop that provides information on selecting food and nutrition supplements for recovery	56 (36.4%)
Printed materials (e.g., handouts or posters) that provide information on recovery nutrition	51 (33.1%)
A practical workshop about how to prepare meals for recovery	41 (26.6%)

Table 8. Respondents' preferences for education on recovery nutrition at the Hong Kong Sports Institute

Discussion

This study investigated the recovery nutrition knowledge of elite athletes at the HKSI. Although it is difficult to compare this research directly with similar studies due to the high heterogeneity in the assessment tools, the mean nutrition knowledge score of our current study falls into 45%–65%, which is the range reported in other studies [9,11,13], and the result corresponds to an unsatisfactory level of sports nutrition knowledge [15]. Therefore, the findings from this study indicates a strong need for additional nutrition education programmes for elite athletes at the HKSI.

There was research finding suggested that low nutrition knowledge could be associated with failure to meet daily nutritional requirements [16]. From our current findings we identified the weakness of our athletes are lacking insights of recovery supplement use, and selecting the appropriate nutrient combination to suit training needs. Future education programmes will be targeted in these areas.

While nutrition knowledge is a major factor that influences behaviour, other factors may also play a role, such as having access to snacks. These factors will also need to be addressed to promote behavioural change in elite athletes at the HKSI.

Most of the respondents agreed that the HKSI provides sufficient food choices for post-exercise recovery. However, despite their agreeing that there is sufficient snack accessibility, they preferred to have grab-and-go foods available, such as cereal bars and snack packs. As accessibility to foods that athletes prefer supports their adequate fuelling, more grab-and-go snack items will be made available at the kiosks or elite corner.

The majority of the respondents reported sensible recovery nutrition strategies, such as not skipping post-training intakes and ensuring that they consume quality protein- and carbohydrate-rich foods or drinks after training. In addition, most of the respondents preferred consuming drinks rather than solid food for recovery.

This study did not establish the association between athletes' knowledge and actual nutrition intake and practice. Therefore, future research should obtain details of respondents' dietary intake and also employ a more equal distribution of groups to obtain statistically significant results.

Conclusion

The respondents agreed that post-training nutritional recovery strategies are crucial, and the majority of the respondents were confident in their ability to select appropriate food and drink to optimise their recovery from strenuous training. However, the respondents' knowledge about recovery nutrition was inadequate, as the average knowledge score was 57%. This highlights the need for the addition of a targeted nutrition education programme for elite athletes at the HKSI to optimise their recovery.

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