Preparation for and During the Games – Nutrition and Recovery

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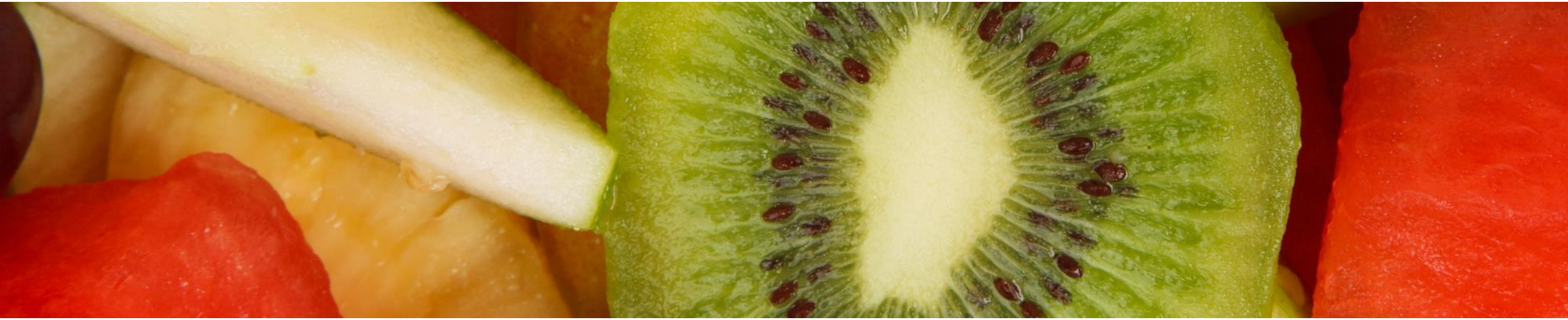


PART ONE

Dietary nutrition for athletes in preparation for an event

Determinants of athletic performance

- ✓ Heredity
- ✓ Motivation
- ✓ Training
- ✓ Injury avoidance
- ✓ Dietary nutrition
- ✓ Nutritional supplement

Good nutrition will not turn a mediocre athlete into a champion,

But bad nutrition can turn a champion into a mediocre athlete.

IOC Consensus Statement on Sports Nutrition (Lausanne, Switzerland 2003)

- Diet **clearly** affects athletic performance.
- All athletes should use targeted nutritional strategies before, during, and after training and competition to optimize their **mental** and **competition** performance.
- Scientifically proven guidelines on the **composition**, **quantity** and **timing of** food intake have been used to help athletes train effectively, thereby reducing the risk of illness and injury.

Composition of diet for athletes

Diet for athletes - When optimizing an athlete's nutrition, it is important to first ensure that the need for basic nutrients is met.

The best composition of diet for athletes?

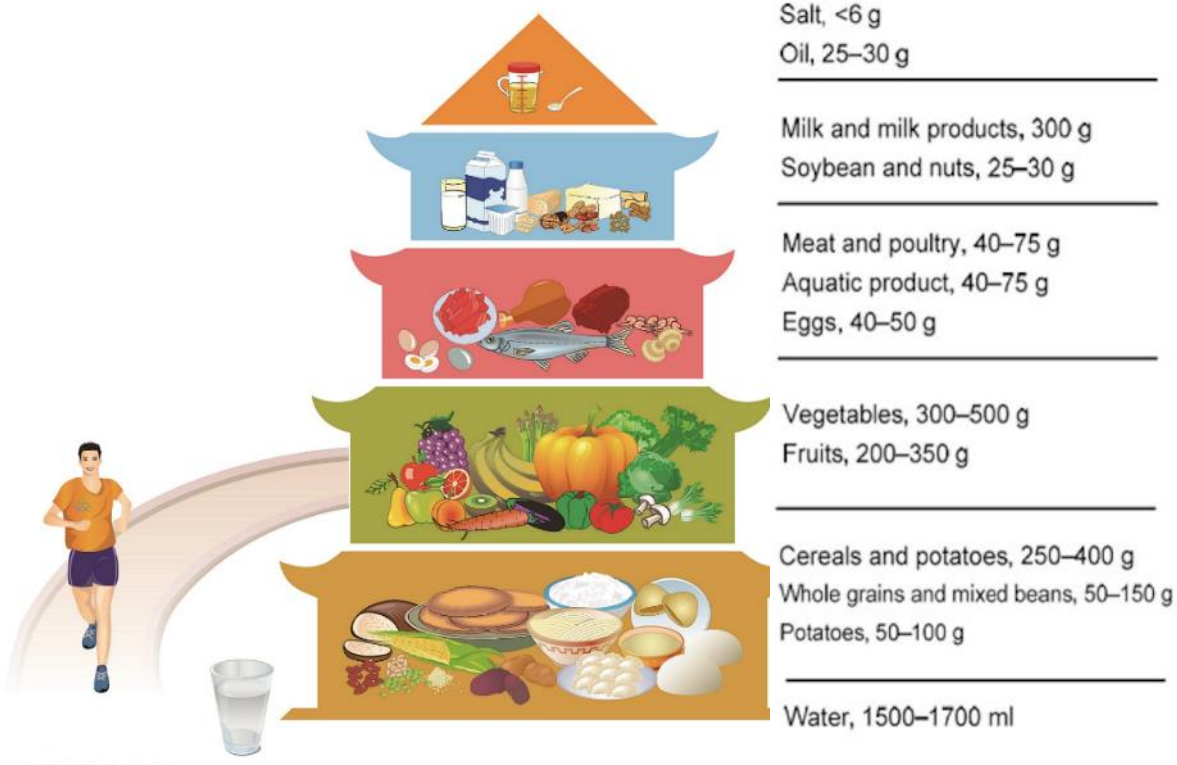
Contains carbohydrates? Fats and proteins? Elevated vitamin and mineral needs?

In fact, there is no single “optimal diet” for all athletes!

Optimal diet ⟷ sport (event) + training (intensity, volume) + body weight/figure

Basic requirements for proper nutrition

Balanced Diet Pagoda for Chinese Residents (2016)



Daily exercise of 6000 steps

Dietary Guidelines for Chinese Residents

- ✓ **Variety of foods, mostly cereal based.**
- ✓ **Balance between eating and exercise, healthy weight.**
- ✓ **Eat more fruits, vegetables, dairy, and soy.**
- ✓ **Eat fish, poultry, eggs and lean meat in moderation.**
- ✓ **Less salt and less sugar, and control sugar and limit alcohol intake.**
- ✓ **Eliminate waste and promote new habits.**

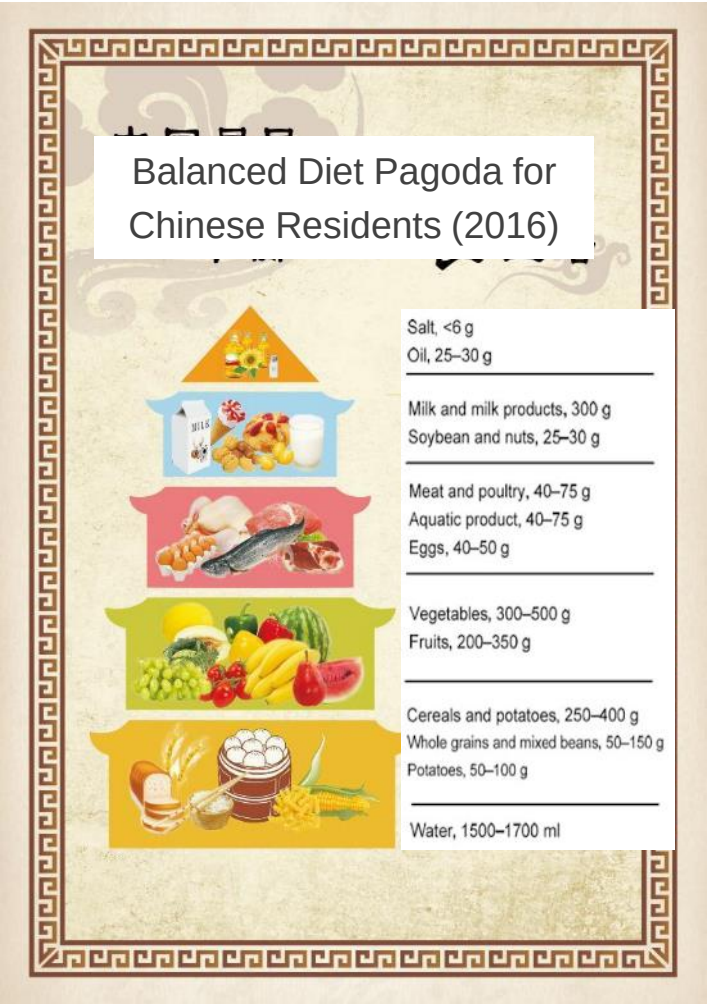
Variety of foods, mostly cereal-based

- Daily meals should include foods such as cereals and potatoes, vegetables and fruits, meat, poultry, fish, eggs and dairy, and soybeans and nuts.
- Consume an average of **12** or types of foods per day and **25** or more per week.
- Consume 250-400g of cereals and potatoes per day, including 50-150g of whole grains and mixed legumes and 50-100g of potatoes.
- **Variety of foods, mostly cereal-based,** is an important feature of a balanced dietary regimen.

Dietary Guidelines for Athletes

- ✓ Variety of foods, mostly cereal based.
- ✓ Balance between eating and exercise, healthy weight.
- ✓ Eat more fruits, vegetables, dairy, and soy.
- ✓ Eat fish, poultry, eggs and lean meat in moderation.
- ✓ Less salt and less sugar, and control sugar and limit alcohol intake.
- ✓ Put emphasis on breakfast and necessary additional meals.
- ✓ Put emphasis on fluid and glucose replenishment.
- ✓ Professional guidance is required for the use of sports nutrition supplements.

(I) Adhere to the basic principles of a varied, comprehensive and moderate diet



Balanced Diet Pagoda for Chinese Residents (2016)

Structure of the “Food Guide Pagoda”

“More of four foods” - more staple foods, vegetables, fruits, dairy or soy products

“Less of three foods” - less fat, meat, and fried foods

(II) A proper dietary plan should set **carbohydrate intake** as the primary target

Carbohydrates - the best source of energy

Athletes must get into the habit of consuming complex carbohydrates on a daily basis, at a standard of **?** g/kg bw/day depending on the type of sport.

Recommended CHO intake for athletes

Recovery phase	Training intensity and load	CHO (g/kg/day)
Immediate post-training recovery (0-4hrs)		1-1.2g/kg/h, multiple times frequently
Daily recovery	Moderate load/intensity training (10 hours/week)	5-7g/kg/d
	Moderate to high intensity endurance training (20 hours +/ week)	7-12 g/kg/d
	Extreme training program (4-6+ hours per day)	10-12 g/kg/d

Updated guidelines from the IOC Consensus on Nutrition for Athletes for the intake of CHO (Burke et al. 2004)

(III) Use the Glycemic Index (GI) for proper food selection

1. High GI foods allow for rapid glycogen replenishment during post-training recovery.
2. High GI foods and fluids during training can maintain an athlete's blood sugar levels.
3. Consuming low GI foods 2 to 3 hours before training can promote the maintenance of blood sugar levels for a longer time.

Foods with different GI values

Low GI (<55)	Moderate GI (55-70)	High GI (>70)
sweet potato	white bread	cornflakes
pea	oatmeal	carrot
citrus	banana	potato
orange juice	raisin	honey
apple	buckwheat	wholewheat bread
ice cream	biscuit	millet
soybean	pasta	rice
peanut		milk
kidney bean		tomato soup
oat porridge		cabbage

(IV) Put emphasis on breakfast and necessary additional meals

Maintain a regular diet to avoid disordered intake.

Snack-type additional meals and **smaller, more frequent meals are** recommended to maintain metabolic rate and blood sugar and increase total energy and nutrient intake.

- The time between meals should not be too long or too short.

The gastric emptying time for mixed meals is 4 to 5 hours, so an interval of 4 to 5 hours between meals is appropriate.

- Pay attention to the distribution of the three meals of the day.

The usual ratio of energy supply is 30 % from breakfast, 40 % from lunch and 30 % for supper.

(V) Limit fat intake.

It is important to limit the consumption of fried foods, fats visible to the naked eye (butter, margarine, meat fats, etc.) and greasy dairy products.

Reduce fat intake by controlling the amount of cooking oil and choosing low fat meat.

- Visible fat:

  Fatty meat, chicken skin, margarine and cooking oils, etc.

- Invisible fat:

  Milk, cheese, lean meat, fast food, snacks, etc.

Learn to read and make good use of food labels

How should food labels be read?

What important information is contained on food labels?

1. Production date and shelf life
2. Storage conditions for the food
3. List of ingredients: The list of ingredients of the food is presented in accordance with the principle of "decreasing amount of ingredients in food".
4. Nutrition labelling: A description of the nutritional information and properties of a food product provided to consumers in the labeling of prepackaged foods, including the "Nutrition Facts" and "Nutrition Claims" and "Nutrient Function Claims" based on the nutrient content and health effects in the "Nutrition Facts".

Product Name:

Xx Brand Yogurt

Product Category:

Fermented milk

Product Standard Number:

19302

Date of production:

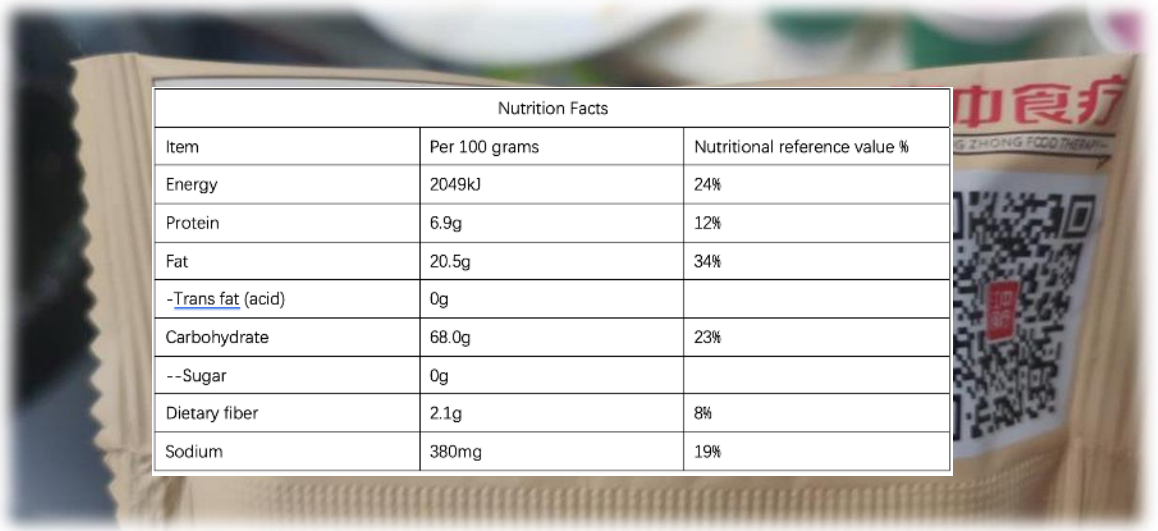
See package coding

Shelf life: 21 days

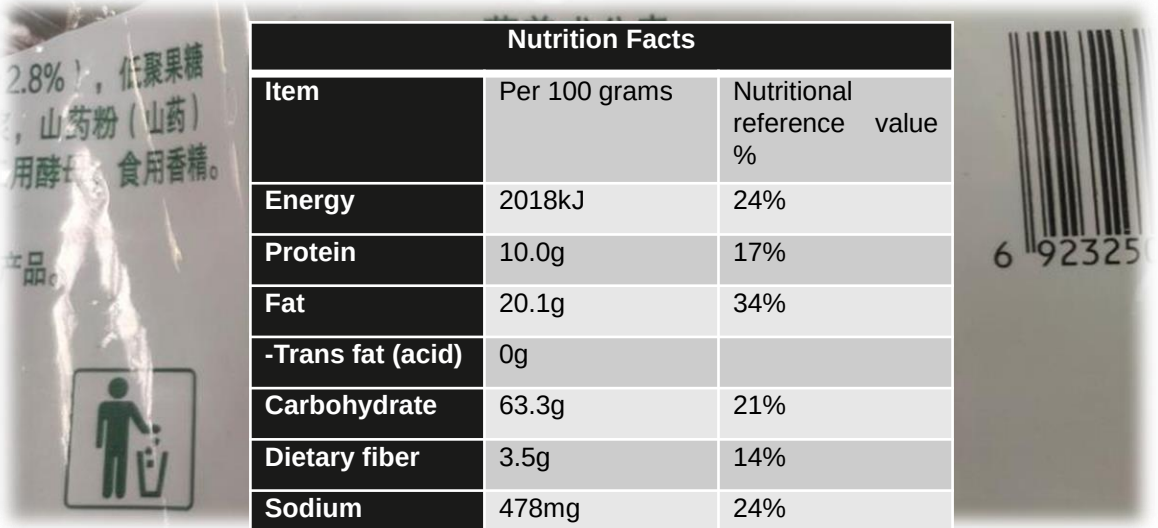
Storage conditions: 2°C - 6°C

Ingredients: raw cow milk
Lactobacillus bulgaricus
Thermophilic streptococcus
Lactococcus lactis diacetyl subsp.

Nutrition Facts		
Item	Per 100 grams	Nutritional reference value %
Energy	333kJ	4%
Protein	4.1g	7%
Fat	4.5g	8%
Carbohydrate	5.5g	2%
Sodium	55mg	3%



Nutrition Facts		
Item	Per 100 grams	Nutritional reference value %
Energy	2049kJ	24%
Protein	6.9g	12%
Fat	20.5g	34%
-Trans fat (acid)	0g	
Carbohydrate	68.0g	23%
--Sugar	0g	
Dietary fiber	2.1g	8%
Sodium	380mg	19%



Nutrition Facts		
Item	Per 100 grams	Nutritional reference value %
Energy	2018kJ	24%
Protein	10.0g	17%
Fat	20.1g	34%
-Trans fat (acid)	0g	
Carbohydrate	63.3g	21%
Dietary fiber	3.5g	14%
Sodium	478mg	24%

(VI) Moderate intake of protein

High-quality protein accounts for over 65%.

Recommended amounts of protein intake.

Endurance type: 1.2-1.4g/kg/d

Strength type: 1.6-1.7g/kg/d

High protein food options for athletes

Food	Protein Content (g/100 g of food)	Food	Protein Content (g/100 g of food)
cheese	20	lean pork	25
chicken breast	27	skimmed milk	4
(chicken) egg	12	soybean	37
egg white	7	tofu	11
fish	19	tuna fish	25
beef	27	Turkey breast	30
veal	30	peanut butter	4.5 (per scoop)
lamb	28	Low fat fruit yogurt	4

Risk of excessive protein intake

- Increased urinary calcium, which is more harmful to athletes with low energy intake and female athletes with amenorrhea;
- Increased burden on the kidneys, predisposing them to kidney disease;
- Dehydration, decalcification, gout;
- Urinary stones and constipation;
- Atherosclerosis and hyperlipidemia.

PART TWO

In-event nutritional strategies

I. Pre-event nutritional strategies

1. pre-event diet is an important part of preparing for an event.

(1) Pre-event meals can be consumed **2 to 4 hours** before the event, consisting mainly of carbohydrates such as **cereals, fruits and vegetables.**

(2) **High-fat foods** should be **avoided**.

2. Pre-event hydration is very important

(1) Fluids replenished before the event should be non-carbonated, non-caffeinated and non-alcoholic, with the best choice being a **sports drink**.

(2) Athletes should make it a habit to carry a water bottle with them at all times of the day so that fluids can be replenished at any time.

3. Do your homework on the athletes' dining hall in advance

Team support staff (especially sports nutritionists) should familiarize themselves with and understand the foods served in the athletes' dining hall in the Olympic Village in advance, and instruct athletes before the event to select and supplement with the right foods at the right time.

4. Avoid the risk of hypoglycemia

Consume CHO **2-3** hours before the event	
Avoid consuming CHO 1 hour before the event, if supplementing is needed, it should be >60g	
Consume CHO during pre-event **warm-up**	
Continuous intake of CHO is required after the start of the event	
Note: Select CHO with **low to medium GI**	

II. In-event nutritional strategies

1. Replenish CHO and fluid during the event

As important as pre-event replenishment, it has the same effect of delaying fatigue and maintaining energy, so any opportunity needs to be taken.

2. Replenishment during intermissions

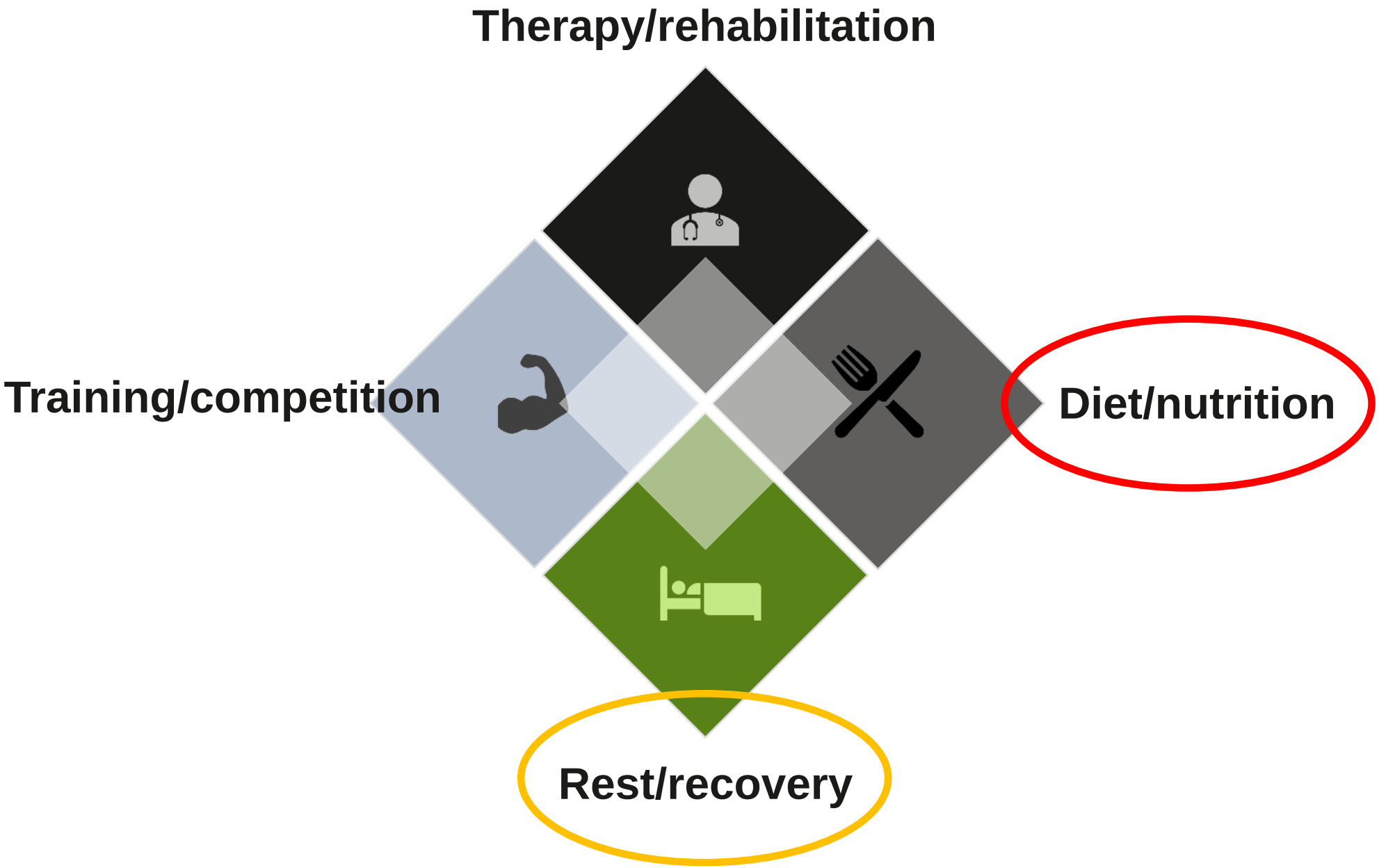
- Short intermissions (injuries, timeouts, even while the event is in progress): quick replenishment of fluids (preferably sports drinks) or consumption of energy gels (50-100 ml of water should be replenished at the same time).
- Long intermissions (half-times, or intermissions between sets or rounds): supplement with small portions of solid food such as energy bars, cereal bars, cut-up fruits (orange segments, apples, bananas, etc.), fruit snacks, cookies, fruit fudge, etc, and drink 150-250ml of water or sports drink.

Note: The above foods should preferably be those usually consumed by the players during normal training/competitions.

III. Post-event nutritional strategies

Post-exercise recovery is an important challenge for modern athletes.

What athletes need to face



Timing of CHO intake

The rate of muscle glycogen restoration was highest **within 1 hour after exercise**.

- Glycogen depletion activates **glycogen synthase**
- Exercise induces increase in **insulin sensitivity**
- The **permeability** of myocyte membranes to glucose is increased

Types of CHO to be consumed

Intake of CHO during the 24-hour post-exercise recovery period promotes glycogen restoration and reserving.

High GI Foods > Low GI Foods

Forms of CHO to be consumed

Muscle glycogen synthesis effect

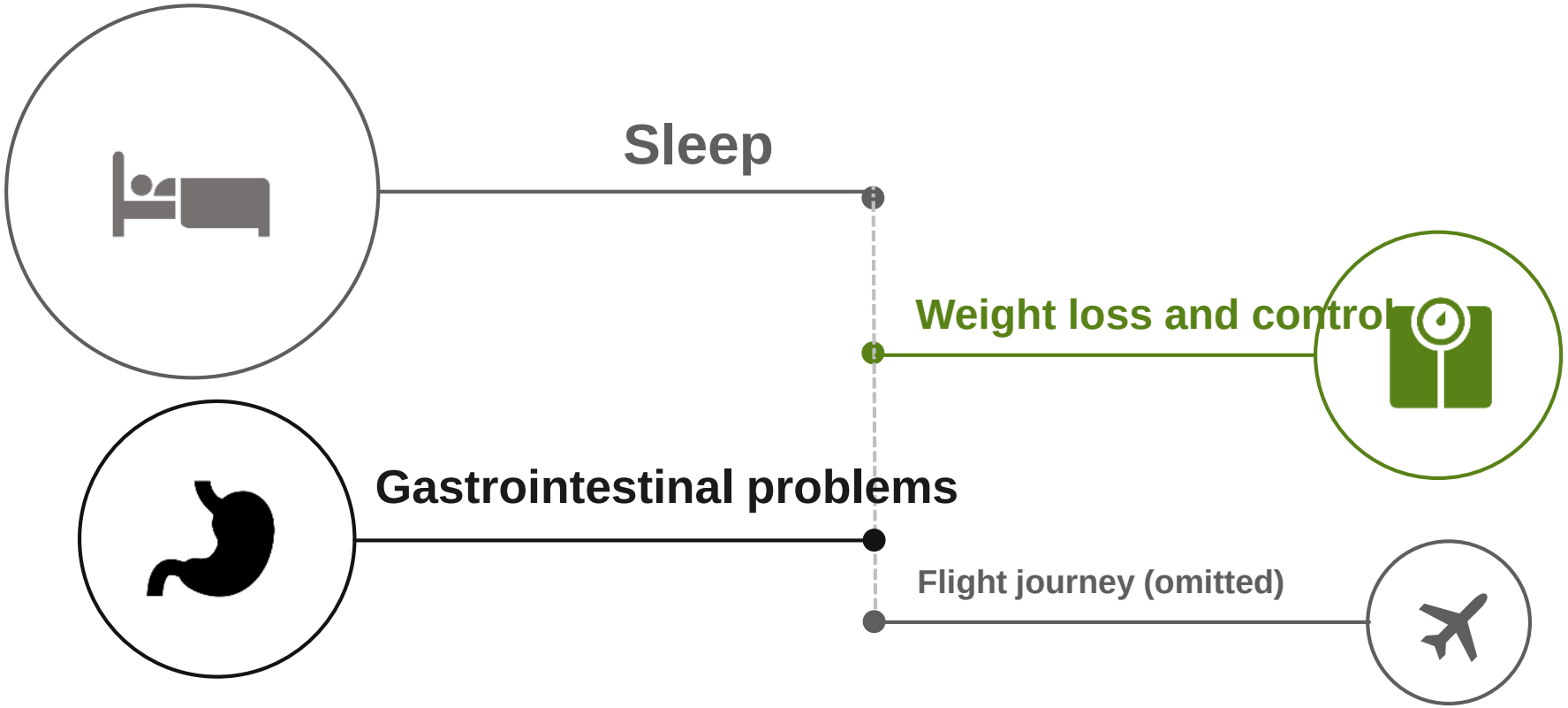
Solid CHO = Liquid CHO

When fatigued and appetite is low, **liquid CHO** or **foods containing more liquid CHO are** more appealing than **solid CHO.**

PART THREE

Nutritional strategies for special issues during the event

Special issues

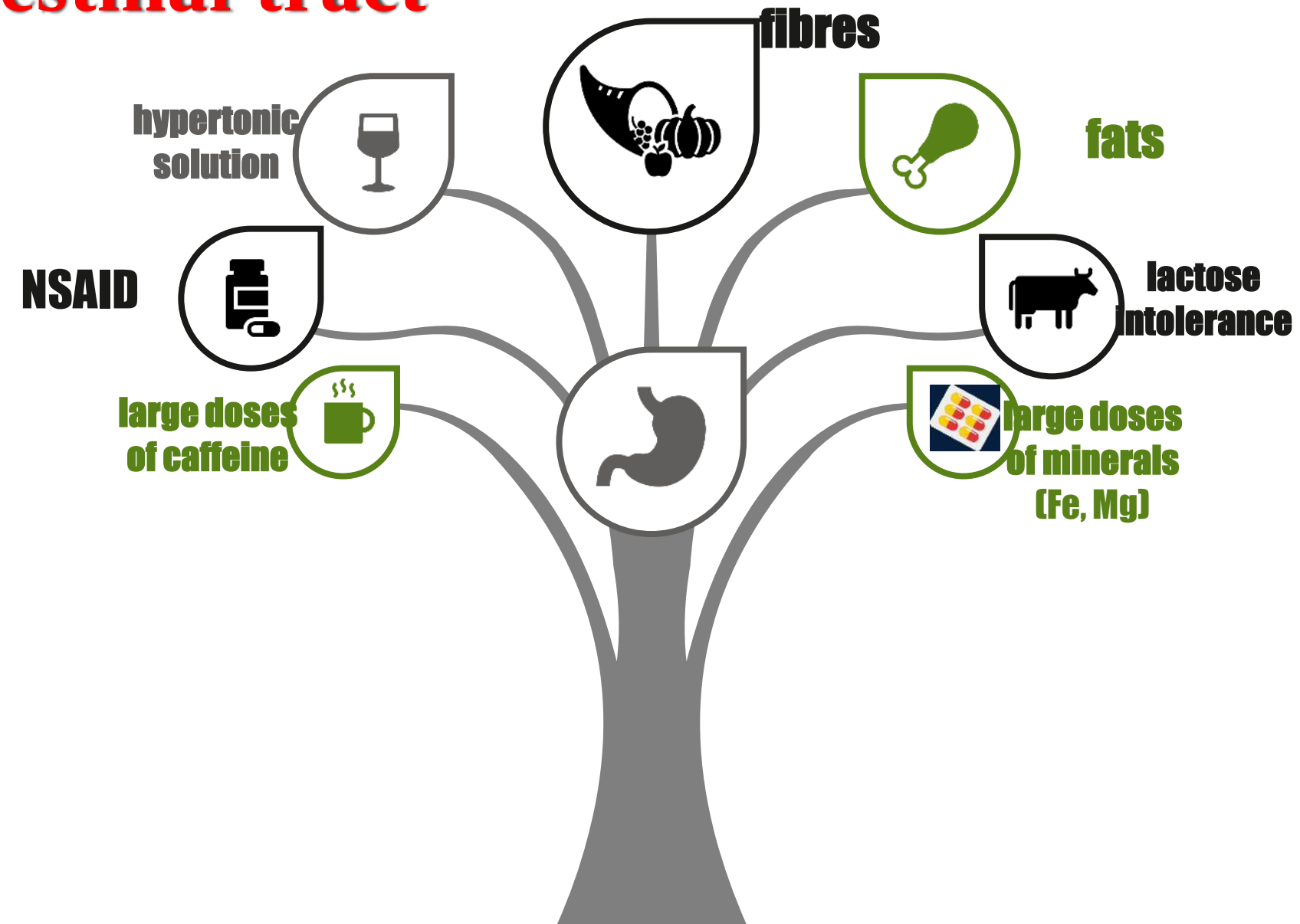


Strategies for improving sleep or extending sleep duration

- Ensure adequate post-event recovery (physical fitness, nutrition, psychology, etc.)
- Consume foods rich in tryptophan (milk, meat/poultry, fish, eggs, legumes and leafy green vegetables)
- Consume high GI foods 4 hours before bedtime
- Balanced nutritious diet

- Reduce alcohol and caffeine intake before bedtime
- Drink the right amount of fluids after the event and before bedtime to avoid frequent nighttime rises
- A hot bath, hot spring bath or foot bath before bedtime; or cool the skin with a cold shower and proper use of air conditioning
- Moderate napping (<45min, avoiding dusk); relax the muscles

Foods and supplements that may affect the gastrointestinal tract



Strategies to prevent gastrointestinal problems

As GI foods have different effects on individuals, foods and liquids (e.g. energy gels) that will potentially be used in a major event need to be tried during high intensity training or simulated competitions in preparation for the event.
Replenish adequate amount of fluid (good hydration) before and during the event.
Avoid foods with high fibre content (e.g. legume, bran, wholewheat bread, large leafy vegetables) before and during the event.
Avoid high-fat foods before and during the event.
Always allow sufficient time for digestion of the main meal before the event (>3 hours is appropriate).
Lactose intolerant persons should avoid dairy products on the event day.
Watch out for NSAIDs (non-steroidal anti-inflammatory drugs): painkillers such as aspirin, acetaminophen (Tylenol) and ibuprofen.
Reduce or stop caffeine intake prior to the event.
Provide psychological counseling on the event day to reduce the psychological stress of the event.

Tips on pre-event (when entering the competition area) nutrition after weight loss and control

Eat more fruits and vegetables;
Check food labels and choose low-energy, low-fat snacks:
Limit intake of condiments, such as sauces, sour cream, salad dressings, etc.;
Eat small, frequent meals; try to divide foods into 5-6 meals;
Consume CHO immediately after training to ensure adequate CHO;
Increase aerobic training to promote fat metabolism, for no less than 1 hour and at a level of intensity that is not excessive;
Pay attention to vitamin and mineral supplementation during the energy restriction period;
Weigh in daily and observe changes in weight.

PART FOUR

In preparation for Olympic events
Pre-event nutrition plan examples

Examples of sports nutrition plan in preparation for the Olympics

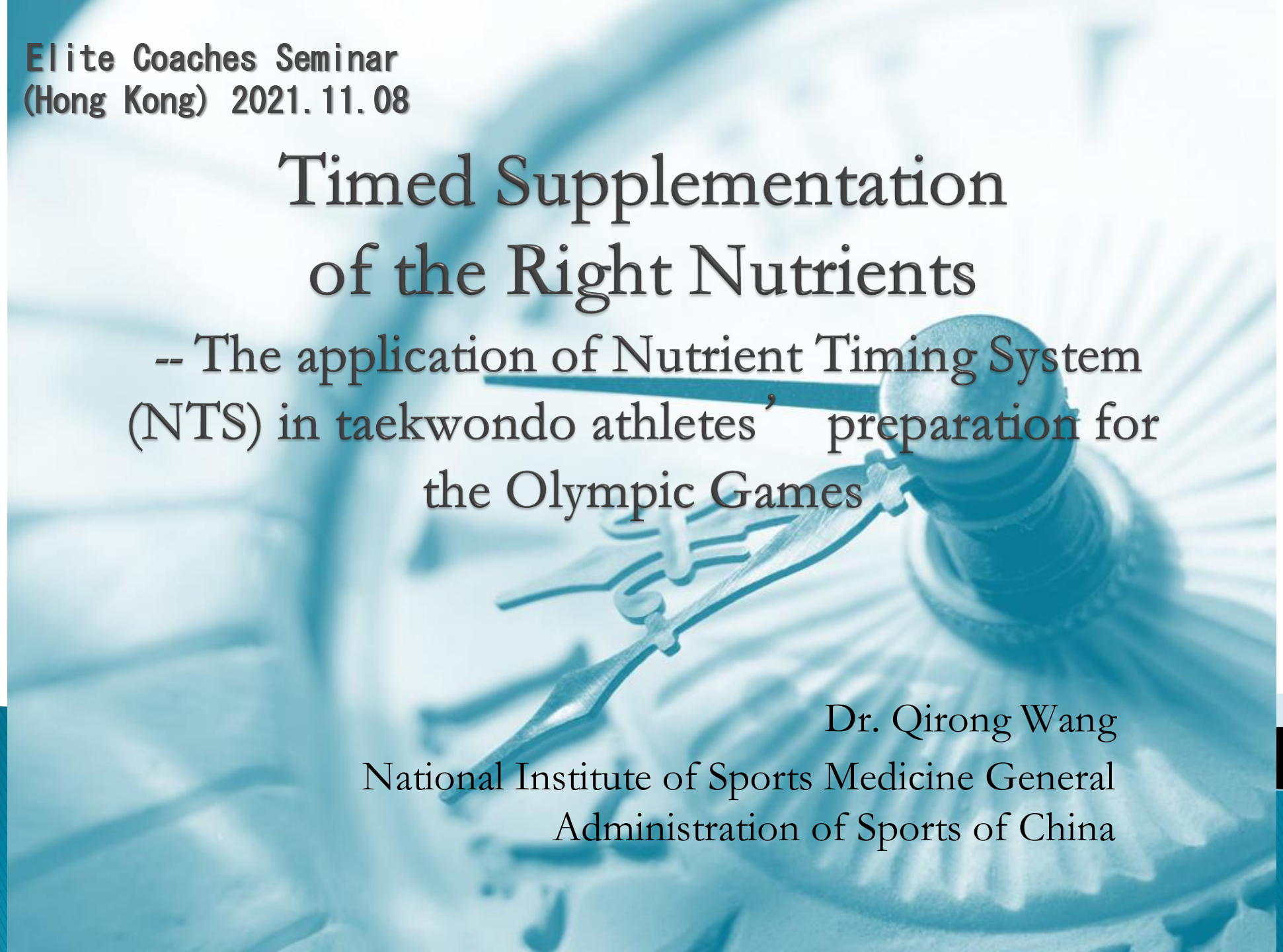
- The case of taekwondo athletes gaining weight in preparation for the 2008 Beijing Olympics
- The case of swimmers reducing weight in preparation for the 2020 Tokyo Olympics
- The overall nutrition solution for athletics (sprint and jump) athletes in preparation for the Tokyo 2020 Olympics

Example 1:
Taekwondo athletes preparing for the 2008 Beijing Olympics
A Sports nutrition case study

Elite Coaches Seminar
(Hong Kong) 2021.11.08

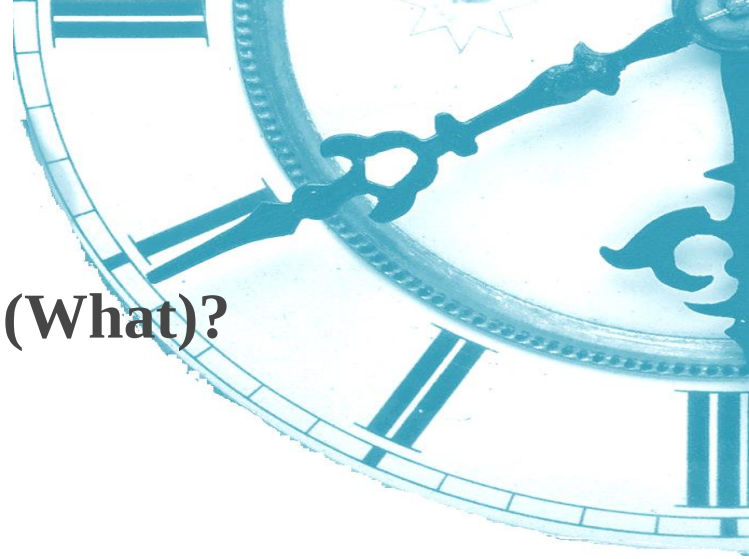
Timed Supplementation of the Right Nutrients

-- The application of Nutrient Timing System (NTS) in taekwondo athletes' preparation for the Olympic Games



Dr. Qirong Wang
National Institute of Sports Medicine General Administration of Sports of China

"Nutrient Timing" is an important nutritional concept of the 21st century that tells us how to optimally schedule sports training and recovery to better achieve the goals that athletes are trying to achieve.



- **The problems NTS is intended to solve:**
  - **What kind of food or drink should I choose (What)?**
  - **When should I consume them (When)?**

- **NTS objectives :**
  - **Optimizing the body's training adaptation (e.g., strength, muscle bulk, endurance, etc.);**
  - **Maintaining good immune function of the body (e.g. reducing the risk of overtraining);**
  - **Promote recovery.**

Energy Phase

10min before and during training

Anabolic Phase

Within 45min after training

Growth Phase

rapid stage

First 4h after training

Growth Phase

sustained stage

16-18h after the rapid segment

Phases and objectives of NTS

(From Ivy & Portman, 2004)

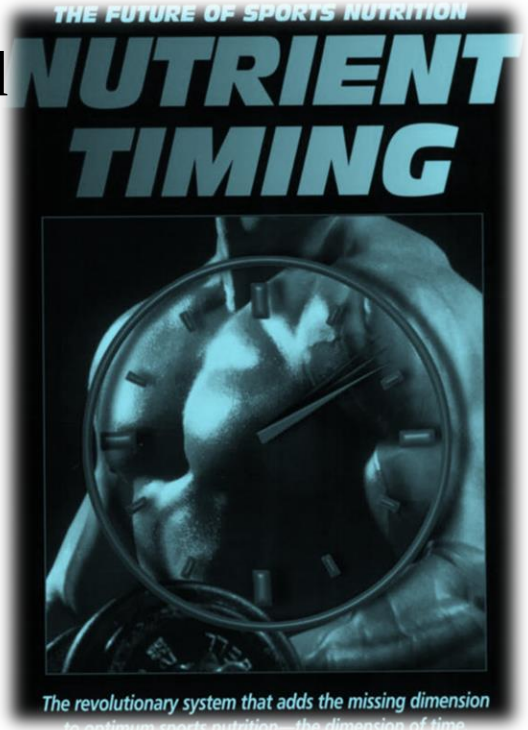
Phase	Time	Expectations to be met
Energy phase	15 to 30 minutes before training	**Increase nutrient delivery to muscles and spare muscle glycogen and protein**
		Limit immune system suppression.
		Minimize muscle damage.
		Set the nutritional stage for a faster recovery following the training
Anabolic phase	Up to 45 minutes after training	**Shift metabolic machinery from a catabolic state to an anabolic state.**
		Speed up the elimination of metabolic wastes by increasing muscle blood flow.
		Replenish muscle glycogen stores.
		Initiate tissue repair and set the stage for muscle growth.
		Reduce muscle damage and bolster the immune system.
Growth phase	Rapid stage First 4 hours after training	**Maintain increased insulin sensitivity.**
		Maintain the anabolic state.
	Sustained stage The 16~18 hours between then and the next session	**Maintain positive nitrogen balance and stimulate protein synthesis.**
		Promote protein turnover and muscle development.

Background

The Chinese men’s taekwondo athletes achieved a major break-through at the 2008 Beijing Olympic Games from its zero "medal" and "place" status in this sport. In addition to effective technical, tactical and physical training, the athletes needed to improve their weight so that they would not be at a disadvantage when they encounter top-notch European athletes. This issue is particularly salient for Liu XX, who competed in the 80+ kg class.

Objective:

To use energy monitoring and opportune supplementation to adjust the means of dietary and nutritional recovery for athletes in weight category sporting events and closely integrate them with the training programs to enable athletes to gain weight and achieve desired goals.



Methods:

Monitoring and measuring time: March 4~6 and June 12~14, 2008

Measures:

1. Monitor the status of energy consumption throughout the day using the SenseWear Armband energy monitor.
2. Measure and analyse the energy intake for 48 hours using the method of weighing according to the “Dietary Nutrition Analysis and Management System for Athletes and the General Population”.

SenseWear® Armband Energy Monitor

Dietary Nutrition Analysis and Management System for Athletes and the General Population

Measures:

3. Learn about and track their actual level of sports nutrition knowledge and use of nutrition products based on interviews;

4. Develop a recipe and nutrient supplementation plan for nutritional interventions for this athlete based on the principle of timed nutrient supplementation and the results of the dietary survey, in conjunction with the training program.

Results:

(1) The (daily) energy intake of Liu XX on the test day was 3890 kcal, and the energy expenditure was 4202 kcal. The daily energy intake was lower than the energy expenditure, and the energy deficit was 518 kcal, which was the main reason for his weight loss. Secondly, Liu XX had a short deep sleep time, accounting for 57.5% of the whole sleep duration, which led to his poor recovery.

Table 1 Daily energy expenditure of Liu XX during the investigation period in March 2008

Time Period	Activities	Energy consumption (kcal)	Training time (hours: minutes)	Lie-down time (hours: minutes)	Sleep time (hours: minutes)
23:30-08:32	sleep	754		9:02	5:12
08:32-09:02	get out of bed	32			
09:02-09:31	breakfast	111			
09:31-11:44	training	1043	2:13		
11:44-12:20	rest, walk	189			
12:20-12:50	lunch	92			
12:50-15:28	noon break	456		1:05	0:30
15:28-16:31	training	501	0:59		
16:31-18:30	rest	255		1:35	0:36
18:30-19:00	dinner	85			
19:00-21:10	rest, walk	280			
21:10-22:15	evening meal	258			
22:15-23:30	rest, massage	146			
	aggregate	4202	3:12	10:52	6:18

Table 2 Daily energy intake of Liu XX from meals and nutritional supplements during the investigation period in March 2008

	calorific value		protein		fat		carbohydrate	
	kcal	%	g	%	g	%	g	%
breakfast	752	20	37.9	20	15.9	19	114.5	61
additional meal	858	23	0	0	0	0	214.6	100
lunch	1052	29	39.2	15	7.7	6	206.9	79
additional meal	0	0	0	0	0	0	0	0
dinner	481	13	39.1	32	10.5	20	57.7	48
evening meal	541	15	69.8	51	26.2	44	7	5
total from meals	2826	77	186	26	60.3	19	386.1	55
total from meals + supplements	3684	100	186	20	60.3	15	600.7	65

Strength athletes should consume 2.00-2.75g/kg BW of protein per day for optimal muscle growth and development.

Ratio of daily energy intake to macronutrients according to the goal				
Goal	Daily Calorie Balance	Protein	Carbohydrate	Fat
Increase strength	Add 50-100 kcal	21-24%	43-46%	33%
Increasing lean body mass	Add 100-200 kcal	21-24%	43-46%	33%
Reduce fat	Reduce 100-200 kcal	26%	41%	33%

From: Nutrient Timing. *Basic Health Press.* 2003.

Daily nutritional composition at 4 different protein intake levels									
Male - **Weight**: 90 kg - **Daily energy intake**: 3,800 kcal									
Protein levels (g/kg)	protein			carbohydrate			fat		
	Energy (cal)	Mass (g)	Percentage (%)	Energy (cal)	Mass (g)	Percentage (%)	Energy (cal)	Mass (g)	Percentage (%)
2.00	728	182	19	1,818	455	48	1,254	139	33
2.25	816	204	21	1,730	433	46	1,254	139	33
2.50	912	228	24	1,634	409	43	1,254	139	33
2.75	1,000	250	26	1,564	387	41	1,254	139	33
Female - **Weight**: 60 kg - **Daily energy intake**: 2,340 kcal									
Protein levels (g/kg)	protein			carbohydrate			fat		
	Energy (cal)	Mass (g)	Percentage (%)	Energy (cal)	Mass (g)	Percentage (%)	Energy (cal)	Mass (g)	Percentage (%)
2.00	473	118	20	1,095	274	47	772	86	33
2.25	532	133	23	1.036	259	44	772	86	33
2.50	591	148	25	977	244	42	772	86	33
2.75	650	163	28	918	229	39	772	86	33

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2.75	650	163	28	918	229	39	772	86	33

(2) In less than four weeks after the nutritional intervention, the athlete successfully increased his body weight from 95.9 kg to 105.3 kg, with an 8.1 kg increase in muscle mass, from 84.8 kg to 92.9 kg, and only a 0.9 kg increase in fat. Fat-free body weight increased by 8.5 kg from 89.3 kg to 97.8 kg, with 90.4% of the increase of which was lean body mass. The weight goal set by the coach was fully achieved.

Table 3 Results of body composition test of Liu XX

Time of Test	Weight kg	Fat-free weight kg	Muscle kg	Fat kg	Total bone mass kg	body fat percentage %
March 2008	95.9	89.3	84.8	6.6	4.47	6.9
May 2008	105.3	97.8	92.9	7.5	4.84	7.1
Difference	+9.4	+8.5	+8.1	+0.9	+0.37	+0.2

From: Wang Q R et al. *Chinese Journal of Sports Medicine.* 2009, No. 2

(3) Energy expenditure and energy intake of the athlete during the follow-up visit post-intervention: Liu XX's daily energy expenditure reached 4966 kcal, while his caloric intake also reached 4953 kcal, i.e., his energy metabolism was basically balanced, indicating that the correction through the intervention produced a significant effect.

(4) After the intervention, the athlete's deep sleep time accounted for 63% of the night rest time, up from 57% before the intervention, indicating that the athlete's quality of rest has improved quite well.

Table 4 Daily energy intake from meals and nutritional supplements of Liu XX during the follow-up visit period in June 2008

Time Period	Activities	Energy consumption (kcal)	Training time (hours: minutes)	Lie-down time (hours: minutes)	Sleep time (hours: minutes)
22:50-06:15	sleep	769		7:09	4:30
06:15-06:28	get out of bed	103			
06:28-07:32	morning exercise	281	0:32		
07:32-07:52	breakfast	46			
07:52-09:30	rest, walk	335			
09:57-11:15	training	754	1:18		
11:15-12:15	rest	98			
12:15-12:45	lunch	96			
12:45-15:32	noon break	567		0:45	
15:32-17:30	training	996	1:38		
17:30-18:30	rest	152		0:35	
18:30-19:00	supper	85			
19:00-20:45	rest, walk	280			
20:45-22:00	evening meal	277			
22:00-22:50	evening rest	127			
	total	4966	3:28	8:29	4:30

Table 5 Daily energy intake of Liu XX from meals and nutritional supplements during the follow-up visit period

	calorific value		protein		fat		carbohydrate	
	kcal	%	g	%	g	%	g	%
breakfast	933	19	41.5	18	42.7	41	95.8	41
additional meal	578	12	49.2	35	0.9	1	93.1	64
lunch	1025	21	59.4	23	10.8	10	172.5	67
additional meal	138	3	4.8	14	6.6	43	14.8	43
supper	1623	33	55.6	14	64.2	35	207.4	51
evening meal	656	13	51.7	31	7.8	11	96.1	58
total from meals	4237	87	208.2	20	125.5	26	571.8	54
total from meals + supplements	4953	100	262.2	21	133	24	679.7	55

Conclusion:

(1) Using SenseWear Armband energy monitor, combined with investigation and calculation according to the "Dietary Nutrition Analysis and Management System for Athletes and the General Population”, we can accurately and effectively monitor and evaluate the energy metabolism of athletes during the training and competition period, and make effective corrections to athletes’ dietary plans.

(2) Carbohydrate and protein supplementation at certain proportions based on a timed supplementation schedule in conjunction with the training program can be effective in increasing lean body mass.

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Example 2: Swimmers preparing for Tokyo 2020 Olympics A Sports Nutrition Case Study

2020 Tokyo Olympics A review of the swimming team's nutritional efforts

- Yu Liang
- National Institute of Sports Medicine General Administration of Sport of China

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I. Nutrition, a part of the power of science and technology

Dietitians are an integral part of the Coaching Team

Case 2: Pre-event muscle gain management for a female athlete

Date	Body Weight (kg)	Muscle (kg)	Skeletal Muscle (kg)	Fat Mass (kg)	Body Fat Percentage (%)
13 July 2021	62.5	47.6	28	20	19.3
29 June 2021	61.8	46.9	27.6	20.1	19.6
23 June 2021	61.3	46.4	27.4	20.1	19.8

Analysis of the results of muscle gain 20 days before departure for the Tokyo Olympics:

1. Weight increased by 1.2 kg
2. Soft lean mass increased by 1.2kg, including 0.6kg in skeletal muscle
3. Fat mass decreased by 0.1kg, and body fat percentage decreased by 0.5%

The athlete won a gold medal at the Tokyo Olympics

II. The nutritional efforts behind Olympic gold medals

1) Energy expenditure monitoring: overall and segmented energy expenditure throughout the day in different training situations

2) Dietary survey: information on the athlete’s total food consumption and dietary structure

3) Body composition test and analysis: the athlete's body composition was measured every 15 days to understand its trend of change, and appropriate nutritional interventions (e.g., for muscle gain, fat loss, etc.) were provided.

II. The nutritional efforts behind Olympic gold medals

4) In conjunction with physiological and biochemical monitoring: analyzed whether there were fatigue and nutrient deficiencies, and proposed solutions after communicating with the research/medical staff

5) Glucose and fluid replenishment and use of sports nutrition products during training

6) Developed a nutritious dietary plan for the pre-event and in-event periods.

III. Ideas for preparing for the Paris 2024 Olympics

1. With a large number of swimming events, the body composition of athletes specialized in different events varies greatly and personalized nutritional guidance is needed for various key athletes.
2. Long-term tracking of key athletes can provide a more comprehensive understanding of them.
3. Communicate more deeply with the coaching team to fully integrate the development of nutrition plan with training plans and physical recovery, etc.

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Example 3: Track and field (sprint) athletes preparing for the 2020 Tokyo Olympics

A Sports Nutrition Case Study

Case Study: Scientific nutritional services in preparation for the 2020 Tokyo Olympics

Xu Bao-lu

National Institute of Sports Medicine
General Administration of Sport of China

Resident Dietitian of the National Track and Field Team

Preparing for the Tokyo Olympics - Winter Training Period

- **Development of** personalized nutrition plans
- **Implementation of** personalized nutrition plans

Development of personalized nutrition plans - results

Objectives	Status of Completion
2% reduction in body fat in 8 weeks	Body fat was reduced to 6.1% (as measured by DEXA of the Sports Science Research Institute at the request of the National Institute of Sports Medicine), a reduction of 2.2% as measured by the same instrument (inbody720), 14.7%-12.5%
Regulating high blood cholesterol through diet	Physical examination had indicated high total cholesterol and abnormal LDL and HDL, LDL and HDL returned to normal at the next physical examination in the subsequent month
Reducing the risk of anemia and aiding in sleep	Requested for ordering dietary supplements, have already issued for using during winter training
Development, compilation of the champion model and one plan for one person	1. Reviewed relevant information to develop the champion model, and according to the champion model developed 7-day person-specific dietary plans for a total of 9 key athletes: Zhu Yaming, Wu Ruiting, Gao Xinglong, and Wang Jianan in the jumping division and Su Bingtian, Xie Zhenye, Liang Jinsheng, Wu Zhiqiang, and Xu Zhouzheng in the sprinting division. 2. Compilation of nutrition plans for key athletes in all divisions of the track and field team (including sprint, jump, middle- and long-distance running, 110m hurdles, race walking, throwing, javelin, marathon, etc.)
Nutrition plan for 3000m physical fitness test	Developed nutrition plans for three days before, one day before, one meal before, during, and after the event
Raising nutritional awareness and understanding of one's own nutritional needs	3 nutrition presentation sessions, interpretation of physiological and biochemical indicators and personalized nutrition recommendations (3 times)

Development of personalized nutrition plans - results

Brief Introduction to the Results for Key Athletes		
Objective	Time Period	Status of Completion
2% reduction in body fat in 8 weeks	2020.7 - 2020.9	Body fat was reduced to 6.1% (as measured by DEXA of the Sports Science Research Institute at the request of the National Institute of Sports Medicine), a reduction of 2.2% as measured by the same instrument (inbody720)
Muscle gain/maximum training recovery	2020.11 - 2021.6	Gained 6.6kg of muscle and maintained body fat at 7%-8% (measured by body fat caliper) (min) (max)
Pre-event weight control	2021.6 - 2021.7	Weight loss of 2.1kg over four weeks without affecting training recovery

Implementation of personalized nutrition plans

	Nutritional Objectives	Measures Adopted
August-October, before winter training	Maintaining athletic performance, and lowering body fat to prepare for muscle gain during winter training	1. Guiding athletes in food selection based on dietary surveys, dietary analysis/assessment, daily dietary monitoring, and cafeteria conditions; providing timely feedback to optimize the dietary solution to ensure a reasonable caloric deficit for fat loss while maintaining athletic performance (caloric expenditure > caloric intake)
		2. Weekly body composition tests to monitor fat loss; biweekly body fat caliper measurement to monitor body fat changes and visually monitor the result of fat loss
		3. Recording daily weight changes; providing timely feedback to adjust the dietary plan to ensure the speed of fat loss (to prevent fat loss from being too fast to the detriment of athletic performance)
		4. Weekly nutritional profiles to record nutritional status and nutritional data, and record the use of nutritional products
		5. Adjusting sports supplements or additional meals for each training session according to the training objectives and actual training conditions; ensuring the implementation of the pre- and post-training nutritional supplementation plans through daily communication and nutritional education
		6. Providing nutrition plans based on medical examination results and monitoring daily to ensure the implementation of the plans
		7. Regularly interpreting biochemical indicator monitoring reports and improving the nutrition plans based on the reports and training of the team and the actual situation in the cafeteria
		8. Providing quarterly nutrition shopping lists based on team member feedback needs and nutritional recommendations
November-January: winter training for build-up purposes	Maximizing muscle gain, reducing fat gain, and promoting post-training recovery	2-8: the same as above Change 1: Guiding athletes in food selection based on dietary surveys, dietary analysis and assessment, daily dietary monitoring and actual cafeteria conditions; providing timely feedback to optimize the dietary plans to ensure a reasonable caloric deficit; reasonably arranging the three meals to ensure muscle gain while reducing fat gain (caloric consumption < caloric intake)
One month before the event: the period for conversion and realization	Lowering body fat, reducing body weight, and increasing the strength-to-bodyweight ratio to improve athletic performance	2-8: the same as above Change 1: Guiding athletes in food selection based on dietary surveys, dietary analysis and assessment, daily dietary monitoring, and actual cafeteria conditions; providing timely feedback to optimize the dietary plans to ensure a reasonable caloric deficit; reasonably arranging the three meals to ensure weight loss while ensuring the maintenance of training recovery (caloric expenditure > caloric intake)
During the event	Maintaining the weight before the event Recovery after the event Nutritional recovery during travel	2-8: the same as above Change 1: Guiding athletes in food selection based on dietary surveys, dietary analysis and assessment, daily dietary monitoring, and actual cafeteria conditions; providing timely feedback to optimize the dietary plans to ensure a reasonable caloric deficit; reasonably arranging the three meals to ensure weight loss while ensuring the maintenance of training recovery (caloric expenditure > caloric intake) 9. Developing and implementing in-travel dietary plans 10. Developing and implementing in-event and post-event dietary plans

Implementation of personalized nutrition plans – a framework for recipes

	Breakfast	Lunch	Supper
Carbohydrate	Bread (whole wheat, white)	Rice can be mixed with coarse grains and mixed beans	Rice can be mixed with coarse grains and mixed beans
	Oatmeal (on a trial basis)	Sweet potato, corn, pumpkin	Sweet potato, corn, pumpkin
	Raisin		
	Fried rice noodles / noodles / kuey teow (flat rice noodles)		
		Note: weight of meat is as per the edible part (for shrimp, the edible part accounts for 70%)	
Meat	Boiled eggs + poached eggs	Beef 150g	Beef 150g
	Chicken breast 50g	Fish/aquatic products 100g	Fish/aquatic products 100g
Vegetable	1 kind	3 kinds of vegetable (1 dark vegetable)	3 kinds of vegetable (1 dark vegetable)
	Nuts		
Fruit	Banana + 2 fruits in rotation	Banana + 2 fruits in rotation	Banana + 2 fruits in rotation
	Warm milk	Milk	Milk
Drink	Milk	Yogurt	Yogurt
	Yogurt	Coconut juice	Coconut juice
	Fruit juice	Fruit juice	Fruit juice
Seasoning	Butter	Pickled mustard tube	Pickled mustard root
	Chocolate paste	Chili sauce	Chili sauce
	Peanut butter	Pickled vegetable	Pickled vegetable
Cooking characteristics	Low fat, moderate protein, high-quality carbohydrate	Sufficient high-quality protein, sufficient carbohydrate	Stimulating appetite, carbohydrates with medium to low GI

Implementation of nutritional support measures for key athletes

Dietary Analysis	Personalized Dietary Recommendation	Daily Lunch/Supper Configuration	Dietary Preference/Taste of Personalized Supplement
✓	✓	✓ Daily	Already adopted and implemented
✓	✓	✓ Daily	
✓	✓	✓ Do my utmost daily	
✓	✓	No request	
✓	✓	No request	
✓	✓	✓ Daily	
✓	✓	✓ Daily	
✓	✓	No request	
Athletes who raised the request			
/	✓	✓ Provided solutions	/
✓	✓	✓ Provided solutions	/

Thank you!

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