RECOGNIZE TO RECOVER
Presented By THORNE

NUTRITION GUIDE: THE YOUTH PLAYER

There are many questions about optimal nutrition for young athletes. Nutrition should support their normal growth and development, but also the increased needs as a result of training. It is also important to create good and healthy nutrition habits that will benefit any young athlete later in life. Nutrition is an important part of the athlete's life, but unfortunately it is not always treated as such.

Young athletes are not just smaller versions of adult athletes. Young athletes have different nutritional needs because they are in a phase of growth, and their physiology and metabolism is different from adults. Here we will discuss the background, as well as some of the practical implications of nutrition for young athletes and their parents.

GROWING AND DEVELOPING

The growth in height of pre-pubertal children between the ages of 2 and 10 years is linear and occurs at a rate of 2.4 inches per year. The median heights and weights for boys and girls are similar, averaging 2ft10 and 26.5 lbs at the age of 2 years to 4ft6 and 70lbs by the age of 10 years. The age for the onset of puberty varies among individuals. Puberty usually occurs in boys between the ages of 12 and 16, while in girls it generally occurs earlier, between the ages of 11 and 14. In some African-American girls, puberty begins even earlier, at about age 9. During puberty, large inter-individual differences exist in development. Children and adolescents need adequate energy intake to ensure proper growth, development, and maturation.

Table 1: Mean weight gain of boys and girls, one to 17 years of age

AGE (YEARS)	BOYS		GIRLS	
	LBS/YEAR	G/DAY	LBS/YEAR	G/DAY
1-2	5.3	6.6	5.3	6.6
2-3	4.4	5.5	4.8	6.0
3-4	4.5	5.8	4.2	5.2
4-5	4.4	5.5	3.7	4.7
5-6	4.4	5.5	4.0	4.9
6-7	4.8	6.0	5.1	6.3
7-8	5.1	6.6	6.6	8.2
8-9	6.2	7.7	8.1	10.1
9-10	7.3	9.0	8.8	11.0
10-11	8.6	10.7	9.9	12.3
11-12	9.9	12.3	9.9	12.3
12-13	5.2	14.2	4.6	12.6
13-14	5.8	15.9	4.2	11.5
14-15	12.0	16.2	7.5	9.3
15-16	12.1	14.8	4.8	6.0
16-17	9.2	11.5	1.8	2.2
17-18	5.7	7.1	0	0

Source: Calculated from WHO references of weight by age (WHO, 1983)

THE YOUTH PLAYER

Dietary Reference Values (DRVs) have been established for various ages, but for the athletic or highly physically active child or adolescent, these recommendations will need to be adjusted for the level of physical activity. In adolescents in particular, the onset of the growth spurt, which is a major reason for increased energy requirements, is unpredictable and it is very difficult to estimate energy requirements. It is well known, though, that prolonged inadequate energy intake will result in short stature, delayed puberty, poor bone health, increased risk of injuries, and menstrual irregularities or absence in girls.

Table 2: Recommended energy requirements, Kcal/day

AGE (YEARS)	MALE	FEMALE
4-6	1800	1800
7-10	2000	2000
11-14	2500	2200
15-18	3000	2200

BEHAVIOUR

It is important to educate children to eat a "healthy and balanced" diet and to encourage good eating habits. For the aspiring young athlete this should also include specific sports nutrition guidance with performance goals in addition to health goals. This can reinforce lifelong eating habits that contribute to the overall well being of children and may enhance sport performance. On the other hand, any bad habits developed in childhood and adolescence may be difficult to eradicate later in an athlete's sporting career and should therefore be avoided. There is an important role for parents, coach and support staff to encourage appropriate eating behaviors, but also to avoid bad habits, such as too much attention to body shape and body weight.

For parents:

- Practice responsive parenting by discriminating hunger from other distress cues and avoiding always using food to comfort your child
- Provide positive, repeated exposure to novel foods (especially typically rejected foods, such as vegetables) to promote acceptance of and preference for those foods
- Offer developmentally appropriate and healthy foods to your child during the transition to solids
- Serve portion sizes that are developmentally appropriate for your child's age and nutrient needs
- Choose when and what your child should eat, but let your child decide how much to eat
- Trust a child of normal weight status to self-regulate his own intake
- Make a wide variety of nutrient-dense rather than energy-dense, nutrient poor foods available and accessible to your child
- Use your own behaviours and attitudes to model healthy dietary patterns
- Create a positive feeding environment by initiating regular family meals

Adapted from: Birch L, Savage JS, and Ventura A. Influences on the Development of Children's Eating Behaviours: From Infancy to Adolescence. Can J Diet Pract Res. 2007; 68(1): s1–s56.

THE YOUTH PLAYER

DIFFERENT METABOLISM IN CHILDREN

There appear to be some differences in fuel use between adults and children. Children's muscles are a bit more like the muscles of endurance athletes (aerobic) and not yet developed for very high intensity (anaerobic) exercise. Children's capacity to produce lactate is lower than adults and this means it is more difficult to sustain high intensity exercise. Children therefore rely very much on fat as a fuel than adults. These differences, however, seem to diminish throughout adolescence, especially in boys, suggesting that the hormones associated with puberty play a role in regulating energy metabolism in children.

PROTEIN

In order to support their growth and development, children and adolescents have protein requirements that are relatively high compared to adults. The Recommended Daily Allowances (RDAs) for protein in the United States are between 1.05 and 0.80 g/kg depending on age with the highest recommendations for 1-3 year olds and lowest for 18 year olds.

However, as for adults, the protein requirements for young elite athletes are likely to be even higher. These requirements may be as high as 1.4 g/kg/day when young athletes play 10-12 h/wk. This would be around 75 g/d in this group, well above the RDA (52 g/d) for children of this age in the general population. However, when athletes are following a complete, well-balanced diet with adequate protein sources, this requirement is easily met with higher daily energy intakes of highly active individuals. In the United States protein intakes by children and adolescents are generally 2-3 times the RDA. On the whole, protein requirements seem to be of no particular concern for most young athletes. Nevertheless, it is important to be aware that there may be some individuals, who, perhaps due to intentional energy restriction for weight loss or a vegetarian diet, have protein intakes well below the recommended amounts.

Table 3: Recommended daily allowances

AGE (YEARS)	MALE	FEMALE
9-13	34	34
14-18	52	46
19-30	56	46
31-50	56	46

Figure 1: Examples of protein sources

Fresh meat: Chicken, turkey, pork and beef

Fresh fish: Cod or salmon

Animal products: Milk, cheese, eggs and yogurt

Vegetable products: Tofu, soy protein, soy milk, legumes, lentils and nuts

Protein powders: NSF certified whey and vegan

THE YOUTH PLAYER

CARBOHYDRATE

It is well known that carbohydrate ingestion in adults both before and during exercise can delay fatigue and improve endurance performance. Unlike protein, which has a quite general recommendation, recommendations for carbohydrate intake rate highly dependent on the intensity, duration and type of exercise that is performed by young athletes.

Although it is important to eat enough carbohydrate to fuel the activity, carbohydrate loading, such as is common practice in endurance sports to increase muscle glycogen levels, is not needed and not advised for children. Since generally their activities are shorter or require less glycogen and their ability to break down carbohydrate is limited, it must be questioned whether such a strategy would be beneficial at all. A relatively high carbohydrate diet is advised but there is no need to follow a dedicated glycogen-loading regimen.

Children can benefit from carbohydrate intake during exercise, as adults do. But this is only useful when the exercise is high enough intensity and long enough duration. Many children will be physically active or engage in regular training but may not reach the level of physical activity that would warrant the use of carbohydrate beverages. However, those young athletes training hard and long enough will probably benefit.

FAT

Very few studies have investigated fat intake or fat requirements in physically active children. The usual general recommendation is that 25-30% of energy should come from dietary fat, but absolute fat intakes in g/d are highly dependent on the energy expenditure. As in adults, the main priorities are adequate protein and carbohydrate intake and fat can make up the remaining energy needs. Restricting fat intake in non-obese children has been suggested to impair growth and development, although it is not clear whether this is a direct effect of low fat intake or low energy intake. The quality of the fats also matters. Choose healthy fats and avoid trans fats.

FLUIDS

One of the main ways that humans lose heat is through the evaporation of sweat from the surface of the skin. As children have a higher ratio of body surface area to body mass (at the age of 8-years-old it is approximately 50% higher than that of an adult), it has been suggested that exercising children should be able to dissipate heat quicker than adults. This should give children an advantage in terms of their thermal homeostasis over that of exercising adults, at least up to the point at which ambient temperature exceeds skin temperature, after which this advantage is supposedly reversed. In practice, however, this has not been found to be the case and adults and active children seem to experience similar body core temperatures, even when exercising at high ambient temperatures. Whether the same finding would occur in young athletes, as compared to these active, but not competitive children, is yet to be determined.

High sweat rates in hot conditions can result in large fluid and electrolyte losses. In adults, the dehydration caused by this fluid loss has been shown to impair both motor control and physical performance, so adults are advised to balance any fluids lost from sweating, with fluid intake or to at least to limit losses to no more than 2% of body mass. However, there are large differences in sweat rates between children and adults. In fact, 9 year-old boys exposed to hot and humid conditions (45°C and

97% relative humidity) had an average sweat rate that was only half of that of men. This muted response, also observed in both young girls and adult females, is probably due to the underdevelopment of the peripheral sweating mechanism in younger boys. In fact, once male sex hormone production starts to increase during puberty, the sweat rate is seen to increase rapidly.

It seems tempting to speculate that if the young athlete's ability to sweat is lower than that of adults, then their risk of becoming dehydrated during exercise in the heat will also be reduced. However, as sweating is the main way of dissipating heat during exercise, it is possible that children's thermoregulation is less effective and their core body temperature could increase at a more rapid rate than an adults.

Studies show that the extent of dehydration, and more importantly, the risk of developing a heat-related illness seems to be similar between adults and younger athletes.

Thus the recommendations regarding fluid replacement are likely to be similar too. The policy statement by the American Academy of Pediatrics, regarding the fluid replacement guidelines for children during exercise in the heat state that a child who weighs 88 lbs should drink 5 oz. of cold water or flavoured salted beverage every 20 min and an adolescent who weighs 132 lbs should drink 8 oz. every 20 min, even if the child does not feel thirsty. Such guidelines are very general and do not take into account important factors such as environmental conditions, exercise intensity, acclimatization and individual differences, but it gives perhaps a rough indication. At an elite level, it seems sensible to develop an individualized strategy that aims to reduce fluid losses in excess of 2-3% body mass. In general, involuntary hypohydration can reach up to 1-2% of body mass loss in boys and this in the vast majority of cases dehydration is not a major issue.

However, in hot conditions it is useful to occasionally measure body weight loss during practice (corrected for fluid intake) to identify individuals who lose more than 3% of body mass and may be under drinking. The reader is referred to the R2R document "Importance of Hydration" for guidance.

DO CHILDREN NEED SPORTS NUTRITION PRODUCTS?

There may be a small proportion of children that will benefit from sports drinks. These are the children that perform intense activity for longer periods of time and generally perform at a higher level. When performance on that day is the key focus, then a sports drink may be appropriate. For the vast majority of cases, water will do fine for hydration. The same is true for other sports nutrition products such as gels, chews, energy bars, and so on. These can sometimes be convenient solutions, but are not strictly necessary.

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THE YOUTH PLAYER

NUTRITION SUPPLEMENTS

While a number of young athletes may use nutrition supplements, you should promote a food first mentality. While a food first mentality is the preferred source of nutrients, when nutrients are lacking, supplementation may be an option in their nutrition. However, especially in young individuals, there must be reservations about most supplements regarding long-term use, combinations and appropriate dosages in an elite young athlete. U.S. Soccer has identified NSF-certified amino acids, multivitamins, electrolytes, probiotics, fish oil, and whey protein as supplements that may be considered in young athletes – only after consultation with a doctor, dietitian, or sports medicine professional.

We start with a food first philosophy. However, it may be challenging for athletes to design and put into action a complete fueling plan. Time constraints, access to fresh, whole foods and grocery stores, culinary and nutritional knowledge, underestimating the additional demands of sport, recovery, and growth, are all factors that may lead many athletes to fall short of the recommended levels of nutrients. We believe with proper education and safeguards such as NSF-Certified for Sport, supplements can be an option when food is not available.

WEIGHT MANAGEMENT

Perhaps one of the greatest potential threats to child health is inappropriate weight control in young athletes that could lead to the development of unhealthy eating behaviours, an eating disorder, or impaired growth and development. If a reduction in body mass is desired, this should be done gradually and limited to no more than 1.5% of body mass per week. A more rapid rate of weight loss than this will likely result in muscle protein breakdown, and this may interfere with growth and development. When possible, the athlete should be counseled by a registered dietitian who has experience of working with athletes and their families.

NUTRITION TIPS

1 | CHECK YOUR FOUNDATION

This may be easier said than done and not everyone may actually agree what healthy means. But one thing everyone will agree on is that heavily packaged foods are generally not as healthy as unpackaged “fresh” foods. Foods that are rich in fiber are also generally healthier than foods that are very low in fiber.

2 | READ LABELS

Often products marketed for kids contain a lot of unnecessary calories. Read labels and watch out for high sugar and high saturated fat content and choose those with higher fiber content.

3 | KEEP AN EYE ON SIZE

Children are not the size of adults, so their meals should be smaller. Also make sure snacks are not meal replacements.

4 | PLAN AHEAD

Sometimes bad nutrition choices are inevitable when traveling and you don’t have access to the foods you would like. The temptation exists to stock up at gas stations whilst you could be eating homemade healthy food, so plan ahead.

5 | EAT AROUND THE EXERCISE OCCASION

To recover quickly, it is thought that carbohydrate intake helps to restore muscle glycogen and protein starts that repair process. Although the window of opportunity may not be as critical as sometimes claimed, the hour after training (or games) is the most effective period for glycogen synthesis and also very effective for increasing protein synthesis.

6 | START HYDRATED

Make sure you start hydrated. This can be done by drinking 3-8 oz. two hours before training.

7 | MEASURE WEIGHT LOSS

Trainers can measure weight loss before and after training and even calculate sweat losses. This is educational and will help to identify those individuals who sweat more and may need to drink more, especially on hot days. It can also help to identify individuals who are gaining weight and thus, are drinking too much.

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