

Theme: Youth Sports and Physical Activity

Physical Literacy: Teaching Children the ABCs of Movement

Rebecca A. Battista, Ph.D., FACSM

Letter from the Editor

A. Lynn Millar, PT, Ph.D., FACSM

Welcome to the October 2015 edition of the *ACSM Fit Society® Page*. This issue addresses concerns related to youth and ideas for incorporating a healthy lifestyle.

After you have read this information that ACSM experts have prepared for you, please feel free to share it with friends and family. We hope these articles will help you and your loved ones pursue a healthy, active life.

As this is the first issue I am editing, I would also like to extend my thanks to Dr. Dixie L. Thompson, FACSM, who served as our editor for many years. I hope I can maintain the high standards she has set.

A. Lynn Millar, PT, Ph.D., FACSM
 Editor, *ACSM Fit Society® Page*
 Email: millaral@wssu.edu

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It is well documented that most youth are not meeting the current recommendations of 60 minutes of physical activity per day. Similar to teaching children the ABCs, it is important for kids to learn how to move and lead an active lifestyle. Just like the goal of teaching children to read and write allows them to explore the world, teaching them to move provides them with the ability to be active for life.

The concept of physical literacy is relatively new, but it is gaining much attention. Physical literacy is defined as “the motivation, confidence, physical competence, knowledge and

understanding to value and take responsibility for engagement in physical activities for life.” Physical literacy highlights the development of basic motor skills throughout childhood and suggests these skills form a foundation for future sport and/or physical activity participation. Think of literacy as it relates to reading and writing—these are essential skills children need to learn in order to be successful. Physical literacy is similar because it relates to acquiring important movement skills that will assist children in being active throughout life. These movement skills are things like walking, running, skipping, hopping, catching, throwing—all of which are considered fundamental movement skills. In other words, fundamental movement skills are the ABCs of future movements!

Fundamental movement skills can be broken down into locomotor skills and object control skills. Locomotor skills include movements like running, jumping, hopping, skipping and galloping. Object control skills include throwing, kicking, catching and striking. Most children (about 60 percent) should be proficient in these skills by ages five to six years. When children become proficient at basic movement skills, they can continue to add to their skill development and continue participating in many forms of physical activity. These forms of physical activity may include sports (*e.g.*, soccer, baseball) or leisure time physical activities (*e.g.*, walking, hiking). When these skills are not well developed, children may not want to participate in physical activities.

Recent campaigns and initiatives like Designed to Move, Lets Move! and Project Play have emphasized the importance of creating positive physical activity experiences with

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children and focusing on basic movement skills. Providing opportunities for children to practice these movement skills, with both structured and unstructured play, is critical. Children need both opportunities and education on the basic skills. The focus should be on developing children's confidence in their skills, allowing them to participate in more activities and ultimately lead a more active lifestyle. It doesn't have to be hard to incorporate more physical activity into a child's life—it can be as simple as a family walk after dinner, going to the park or turning off the screens for an hour to play outside.

Theme: Youth Sports and Physical Activity

Training Healthy Youth Athletes

Andrea Stracciolini and Michele LaBotz



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Young athletes are faced with many unique issues that place them at increased risk for injury. In particular, individuals who specialize in one sport at an early age or train at higher volumes appear to be at a markedly higher risk for serious injury. Recent studies show highly specialized

young athletes are almost twice as likely to sustain a serious overuse injury as compared to participants who are not specialized. Also, young athletes participating in more hours of sports per week than age in years (for example, more than 10 hours a week for a 10-year-old) or whose ratio of organized sports to free play time was greater than 2:1 hours per week had increased odds of having a serious overuse injury.

Recovery and Sleep

The cause of overuse injuries includes repetitive submaximal loading of the musculoskeletal system with inadequate rest and recovery time to allow for structural adaptation. Attention to sleep patterns is critical to this recovery in young developing athletes. Sleep duration appears to be an independent factor associated with injury, with a recent study showing that the athletes who slept an average of less than eight hours per night were more likely to have had an injury when compared to athletes who slept for greater than eight hours. Furthermore, fatigue-related injuries in athletes are related to sleeping less than six hours the previous night.

Athlete Development

In addition to increasing injury risk, early specialization creates multiple issues in young athletes. In 2014, the United States Olympic Committee unveiled its American Development Model (ADM) as a framework for best practices in training and developing young athletes. The goals of the ADM are to provide young athletes with early positive experiences in sport, to allow individuals to realize their athletic potential and to promote long-term participation in sport and healthy levels of physical activity.

The basic principles of the ADM include:

- Universal access to sport and physical activity opportunities
- Encourage multi-sport participation
- Educated coaching at all level of sport
- Emphasis on fun, engagement of coaches and athletes and developmentally appropriate skill acquisition and training
- Development of fundamental movement skills and physical literacy (see related article in this issue)

The ADM consists of five progressive stages of training and participation. Age ranges are approximate and overlapping due to variability in rates of individual motor development:

- **Stage 1:** Discover, Learn and Play—12 years old or younger. Focus on fun, development of basic motor skills and opportunities for deliberate play.
- **Stage 2:** Develop and Challenge—10-16 years old. More focus on sport-specific skill, socialization and teamwork, emphasis on progressive training, introduce competitive opportunities.

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- **Stage 3:** Train and Compete—13-19 years old. Emphasis on sports-skill development. Progressive training and competition appropriate for skill level.
- **Stage 4:** Consists of two parallel tracks—15 years old and older.
 - **Track 1:** Participate and Succeed: Emphasis on fun, as well as personal challenge and achievement
 - **Track 2:** Excel for High Performance: Focus on maximizing athletic potential
- **Stage 5:** Mentor and Thrive: Active for life. Lifetime involvement in sport and healthy levels of physical activity.

Theme: Youth Sports and Physical Activity

Are Children Drinking Enough During Exercise?

David A. White, Ph.D., CEP



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By some estimates, two-thirds of child athletes are dehydrated during exercise. Proper hydration is vital for regulating temperature, maintaining blood volume and eliminating waste. Water loss from sweat, urine and increased metabolism can lead to dehydration in active youth, with potentially serious consequences.

One of the primary reasons for children to hydrate properly is to maintain an appropriate temperature. While adult bodies are cooled mostly through evaporation of sweat, children's bodies cool mostly through "dry" conduction and convection. For example, when a child's body temperature increases while exercising or being in a warm environment, the blood vessels near the surface of the skin enlarge. The body sends warm blood to the dilated blood vessels to release heat to the surface of the skin, similar to the way a radiator works in a car. The cooled blood then returns to the center of the body. A dehydrated child, however, does not have enough blood available to be transported to the skin and the exercising muscle at the same time. As a result, children have a higher risk of heat-related illnesses, such as muscle cramps, heat exhaustion or heat stroke. Dehydrated children also risk a drop in blood pressure, which can make them feel dizzy or light headed during or immediately after a bout of exercise, with the potential for injury.

In addition to affecting thermoregulation, dehydration in children can have particularly strong effects on both exercise ability and performance of mental and physical tasks. In adults, a loss of two percent of body weight from dehydration can cause considerable decreases in the ability to perform these tasks. However, in prepubescent children, these changes are evident at a loss of only one percent of body weight, leading to possible loss of coordination, decreased energy and muscle fatigue.

The easiest way to determine dehydration in a child is to monitor the color of the child's urine. Another method is to weigh the child before and after the activity. A general rule of thumb is the urine should be similar to lightly colored lemonade. For a specific urine chart, please visit www.hydratationcheck.com/pocket_chart.php. Body weight decreases of one to three percent represent minimal dehydration. Decreases of three-to-five percent represent significant dehydration, and more than five percent represent serious dehydration. Be aware: the sensation of thirst is not a reliable marker of adequate hydration.

What should active children drink? Non-caffeinated and non-carbonated fluids are best throughout the day and during and after physical activity. Children should rehydrate slowly, but steadily, within two hours of exercising, preferably with water. Sports drinks should be consumed only when physical activity is continuous for more than an hour. After exercise, children should rehydrate with 0.3 oz per pound of a child's weight for each hour of exercise. Another way to think about this is replacing the weight lost during the activity. Children should drink from bottles, rather than drinking fountains to ensure they are drinking enough. Lastly, to ensure that fluids are being fully absorbed, all active children should eat some healthy salty foods, such as pickles, salsa or pretzels.



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Adolescents and ACL Injuries: Current Research and Future Challenges

Robin Queen, Ph.D., FACSM



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With the growing popularity of youth team sports such as soccer and basketball, there has been a substantial increase in the number of athletic injuries among adolescents. Each year, many high school students experience season- or even career-ending athletic injuries, yet surprisingly little is known about how to avoid these injuries or rehabilitate youth after such an injury.

One of the most devastating and more common injuries in youth sports is an anterior cruciate ligament (ACL) tear. Nearly one in 60 adolescent athletes will suffer an ACL injury during their athletic career, and many of these athletes will undergo an ACL reconstruction. In adolescent athletes, girls are five-to-eight times more likely to tear their ACL when compared to boys. Many studies have compared the differences between girls and boys in an attempt to understand the difference in the injury rates. These studies have identified many anatomical, physiological and behavioral factors that differentiate boys and girls; however, the exact reason for the difference in injury rates is still unknown. The best approach to rehabilitating injured adolescents and getting them back onto the field remains unclear.

Differences in strength, landing mechanics, cutting mechanics, hormone levels and training programs have all been identified as possible risk factors for ACL injuries in adolescent athletes. In addition, many programs have been designed to try and prevent these injuries and have found some success. Probably the most well-known of these programs is the FIFA-11+, which is designed to help prevent soccer injuries in adolescent athletes over the age of 14. This program is designed in three parts: 1) warm-up consisting of running at low speeds, along with stretching and controlled partner drills; 2) six sets of exercises that focus on core and leg strength, as well as balance, plyometrics and agility with increasing difficulty; and 3) running exercises and drills that are completed at moderate-to-high speeds and incorporate planting and cutting movements. Following the implementation of this program, studies have reported between a 30 percent and 70 percent reduction in the

number of injuries. While not all of these were ACL injuries, this type of program provides a basis for the development programs that are being examined to reduce ACL injuries by focusing on changing the way an athlete lands or cuts during sport. Motion capture technology, similar to that used for making video games, can be used to collect data on the way an athlete moves and then provide feedback on possible risk factors for ACL injuries. This feedback can be used by athletes and trainers in programs designed to improve strength and flexibility while retraining the athlete's natural movement style.

In addition to the prevention of the initial injury, it is important to consider how athletes return to sports following an ACL surgical reconstruction and physical therapy. When compared to an athlete without a previous ACL injury, adolescent athletes have a 15-times greater risk of sustaining a second ACL injury, either to the same leg or the other leg after returning to sports following an ACL reconstruction. Currently there are no definitive standards in orthopaedic surgery or physical therapy that guide decisions about when to return to sports, although evidence based recommendations have been suggested within each specialty. Instead, these decisions are made by the athlete's parents and coaches, primarily with input from the treating surgeon along with insights from the physical therapist. Physical therapy recommendations for return to sports following reconstruction include, not only strength and range of motion, but also the ability of the athlete to complete various sport-specific activities or tests. Recent research makes it clear that patients who have been allowed to return to sport often have residual muscle weakness and imbalances, as well as movement patterns that are different between the surgical and nonsurgical legs. This imbalance shows up in analysis of the tasks and self-reports from athletes. These data are essential to well-informed, safe decisions about return to sport. While youth athletes are anxious to return to sports quickly, it is vital that they and their parents understand the long-term consequences of returning before they are completely recovered.

Currently, the best advice for adolescent athletes is to warm up and condition appropriately before beginning a competitive season, and for coaches and parents to be aware of the risk factors for injury, which include movement and coordination differences between the legs, muscle weakness and poor conditioning leading to early fatigue. Adolescent athletes should be encouraged to participate in a variety of sports in order to develop coordination and strength throughout the body and avoid early specialization into a single sport that could lead to muscle strength imbalances and, potentially, increase the risk of injury. With ACL injuries being more prevalent in girls, it is important that girls begin to participate in physical activities at an early age to develop the strength and coordination that can help them move better and decrease their risk for ACL and other sports-related injuries.

Ultimately, all of these approaches can reduce sports injuries and increase athlete satisfaction, while decreasing the long-term impact of sports injuries and allowing athletes to enjoy sports throughout their lifetime.

Fruits & Veggies— Do You Eat Too Few?

Nancy Clark, M.S., RD



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Feeling ashamed and embarrassed, many of my clients “confess” they eat too few fruits and vegetables. They totally understand that fruits and veggies are good for their health and better than vitamin pills, but they can’t figure out how to enjoy them more often—or how to get inspired to learn to

like them. Sound familiar? Maybe this article will help you boost your intake of these healthful sports foods.

I Know I Should Eat More Fruit for Snacks, But I Just Don’t...

When hunger strikes, a piece of fruit is unlikely to be your snack of first choice because it is not very hearty. That is, calorie-dense apple pie with ice cream can easily be far more appealing than just an apple. One solution: plan to make the snack heartier by pairing fruit with protein. For example, enjoy an apple (or grapes) with cheese, smear a banana with peanut butter or combine raisins with nuts. Would that boost the snack-appeal?

How Many Fruits/Veggies Are Enough?

Ideally, you should eat a fruit or vegetable at each meal. If you don’t/won’t/ can’t do that, at least eat a pile of veggies with dinner to compensate for no produce at the other meals. You could also create a loaded smoothie at breakfast that has enough fruit (and veg) for the whole day.

Other suggestions include:

- **Breakfast:** large banana on cereal; lots of berries in yogurt; tall glass of orange juice
- **Lunch:** extra tomato and spinach in a wrap; big bowl of fruit salad; large apple (with cheese) for dessert
- **Snacks:** tart cherry, grape or blueberry juice; banana (with peanut butter); dates; dried pineapple; vegetable juice
- **Dinner:** Pre-dinner munchies: baby carrots (with hummus), cherry tomatoes; at dinner: big pile of cooked veggies; extra-large side salad.

The more you eat, the more nutrients you get.

Eight ounces of orange juice offers all the vitamin C you need for the day. So does one stalk of cooked broccoli and half a green pepper. Could you consume a taller glass of OJ, a bigger pile of broccoli, or munch on a whole pepper (like you’d eat an apple)? You’d consume double the vitamin C—plus electrolytes and many other health-boosting compounds.

What If I Don’t Like Kale...?

Although kale is nutrient-rich, it is not the only green vegetable with health-value. Here’s how some green veggies compare, based on a 50 calorie cooked portion. (Note: “%” = % of the amount you should consume each day):

| Vegetable 50 calories | Vit. A | Vit. C | Calcium | Magnesium | Folate |
|--------------------------|--------|--------|---------|-----------|--------|
| Kale, 1.5 cup | 188% | 106% | 14% | 11% | 6% |
| Spinach 1.25 cup | 167% | 30% | 30% | 63% | 82% |
| Broccoli 1.5 cup | 16% | 125% | 6% | 10% | 40% |
| Asparagus, 1.25 cup | 16% | 23% | 5% | 10% | 83% |

Don’t Like Many Veggies?

Because fruits and vegetables offer similar nutrients, you can swap one for the other. That is, if you don’t enjoy red tomatoes, at least try to have red strawberries, red apples or red peppers. In general, you want to consume a variety of colors of fruits and/or veggies—and enjoy a rainbow of health:

- **Red** strawberries, apples, watermelon, tomato
- **Orange** oranges, mango, papaya, sweet potato
- **Yellow** pineapple, peaches, summer squash
- **Blue/purple** blueberry, plums, eggplant, purple grapes
- **Green** kiwi, honeydew melon, green grapes, broccoli, spinach, kale, peppers
- **White** banana, onion, potato, cauliflower

But They Rot...

Many athletes live alone, rarely cook, and get tired of wasting money tossing out rotten produce. If that’s your case, some solutions include:

- Buy bags of frozen vegetables and fruits (freezing retains the nutrients); even canned ones are nourishing.
- Buy the desired portion of greens and other salad (or stir-fry) ingredients at the salad bar. Instead of buying a whole head of lettuce, of which half might end up rotting in your refrigerator, buy just what you need.
- Cook enough veggies for several days. For example, bake several sweet potatoes at once, or make a big pot of ratatouille with eggplant, tomatoes, zucchini and onion.

Can I Eat Too Many Fruits and Vegetables?

Doubtful, unless you eat them to the exclusion of other foods. For example:

- If your dinner is just rice with stir-fried veggies (no tofu, chicken, or protein-rich food), the meal lacks adequate protein to build and repair muscles. Solution: Either add a protein, include a glass of milk with the meal or enjoy Greek yogurt for dessert.
- If you follow a Paleo-type diet and eat only protein and veggies for meals (no grain), your meal could easily lack adequate carbs to refuel from hard exercise. Solution: include starchy root vegetables, such as carrots and beets.
- If you are a vegetarian and prepare pasta with just tomato sauce (no meatballs), the meal lacks protein. Solution: choose protein-enriched pasta and add a salad with beans, nuts, extra cheese.

If you are dieting without success, you might be consuming more calories than you realize from yet-another handful of grapes.

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That (large) apple might have 150 calories, as does the bag of baby carrots. While the calories are healthful and preferable to cookies, they still count. Fruits and veggies tend to be “guilt-free” but they are not totally “calorie-free.”

Q&A

James MacDonald, M.D.



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Q: I know how important it is for my three kids to stay active throughout childhood and the rest of their lives. My son plays travel soccer and my two girls play softball and basketball—they all love their sports! My question is: by playing these sports, are they being as active as they can be?

A: The short answer is: maybe not. Your children may not be getting the recommended levels of physical activity for their ages simply by playing sports. Let's start with what's recommended. The

American Academy of Pediatrics (AAP) and guidelines from the U.S. Department of Health and Human Services state that children should get 60 minutes of moderate to vigorous physical activity (MVPA) every day. The AAP and other bodies have gone on to give parents some indication of what activities fall under the category of MVPA; active commuting like walking to school is a moderate activity; and playing a game of tag is a vigorous physical activity. The Centers for Disease Control and Prevention (CDC) has a good website listing a variety of common activities, and which ones qualify as MVPA.

So now the question is: by playing organized sports, are kids in their games and practices getting 60 minutes of MVPA? There is a very interesting study that suggests sports practices do not expose children to recommended levels and duration of MVPA. The researchers found that, overall, only 24 percent of the children got 60 minutes or more of MVPA. For kids ages 11 to 14 and girls playing softball the situation was even worse: 10 percent of the older kids and only two percent of the softball players reached the recommended levels of activity!

The authors go on to suggest some changes that may make youth sports practices more conducive to keeping kids active while they learn sport-specific skills. These include emphasizing participation over competition; tracking activity levels with

pedometers and accelerometers in games and practices; and adopting coaching strategies that encourage continuous movement and eliminate idle time when running drills and practices, etc.

Sports are great for kids on so many levels, and they can help keep kids active. Do not assume, however, that they will entirely solve the problem of how your kids can get adequate levels of healthy activity. Sports are no substitute for P.E. at school, or active commuting, or turning off those screens and doing chores or playing games around the house!

Q: My daughter is 10 years old and a serious soccer player, though she also likes swimming a lot. The recent victory of the USA women in the World Cup has inspired her. She tells us that she now wants to specialize in soccer so she can be the best she can be, get a college scholarship and maybe make the USA Team for World Cup 2023 or 2027. Should I let her specialize?

A: This is a very difficult question that many families face. The bulk of the evidence suggests that, in your daughter's case, you should continue to encourage her to play multiple sports and hold off on specializing until she's older.

We would have you consider two things when making this sort of decision: 1) will early sport specialization help your daughter achieve her goal to earn a soccer scholarship and 2) does early sport specialization carry some unforeseen risks that should make you avoid it?

A recent study found that for UCLA Division 1 male and female athletes, 88 percent participated in two-to-three sports as children; furthermore, the author found that 70 percent waited to specialize in the sport they were participating in until after the age of 12.

Rates of overuse injuries and burnout in youth athletes who specialize must also be a consideration. One survey article concluded that “There is a concern that early sport specialization may increase rates of overuse injury and sport burnout.” Though much research remains to be done to better clarify the specific risks associated with early sport specialization, the expert panel's consensus was solidly in favor of sport diversification for youth athletes. Specifically, the panel concluded that diversified sports training up to mid-adolescence was likely to be safer and more effective than taking the road of early sport-specialization.

You'll read about research results coming out regarding this issue over the next few years, as it is a 'hot topic' in sports medicine. And, as evidence evolves, the expert thinking on this issue can change, too. At this moment in time, the broad consensus is to hold off on sport specialization until the high school years.

So, tell your daughter that you support her goals and you'd love to see her play in the World Cup. The path to getting there, however, lies in holding off on focusing solely on soccer until she's a little older.