



Physical Activity Issues and Concerns

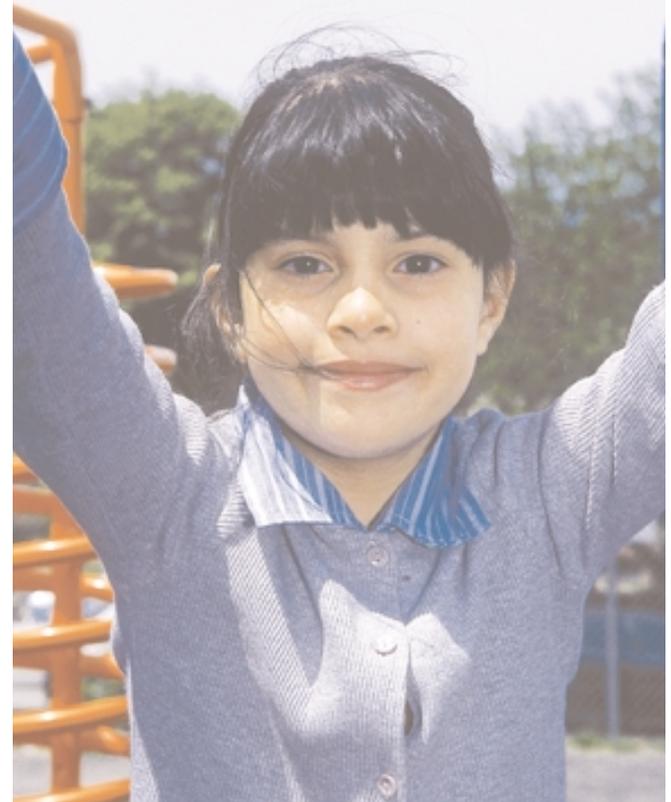
ASTHMA

Asthma is a chronic lung condition in which airway inflammation results in recurrent breathing problems. Approximately 5 million children and adolescents in the United States have been diagnosed with asthma.¹ However, it is likely that asthma goes undiagnosed in many children and adolescents.² Minorities, particularly African Americans, experience a higher incidence of asthma than whites. Children and adolescents living in the inner city also suffer from a disproportionately high incidence of asthma.¹ In addition, children and adolescents from families with low incomes and from single-parent households are more likely to have an asthma-related disability.³ Asthma in children and adolescents is a leading cause of school absenteeism and ranks first among chronic conditions that limit children's and adolescents' participation in physical activity. And children with asthma and obesity have more frequent and longer-lasting asthma attacks.⁴

Vigorous physical activity may cause asthma symptoms in children and adolescents whose asthma is poorly controlled. As a result, many children and adolescents with asthma limit their physical activity, which can lead to poor physical fitness status. Children and adolescents with asthma who limit their physical activity usually do so because of misinformation, fear, or mismanagement of their condition, not because the condition demands these limitations. Improved understanding of and treatments for asthma will help children and adolescents with asthma participate fully in physical activity.

Exercise-induced asthma (EIA), which occurs in almost 90 percent of children and adolescents who have asthma and in approximately 40 percent of

children and adolescents who have allergic rhinitis, can occur without other forms of asthma.⁵ People who do not suffer from chronic asthma can still have EIA, an intermittent physical-activity-triggered narrowing of the airways. It is believed to be caused by a loss of heat, water, or both from the lungs during physical activity, triggered by rapid, deep breathing of air that is cooler and drier than the interior of the respiratory tree. EIA usually occurs during vigorous physical activity or several minutes after, reaches its peak 5 to 10 minutes after cessation of activity, and resolves in another 20 to 30 minutes.^{6,7}



Symptoms and Causes

Symptoms of asthma include wheezing, breathlessness, chest tightness and pain, and coughing. These symptoms can resolve spontaneously or can be reversed with treatment.

The airways may be sensitive to a variety of stimuli, or triggers. Exposure to these triggers induces narrowing, swelling, and blockage of the airways and thus results in asthma. Common asthma triggers include the following:⁸

- Intense, prolonged physical activity, especially in dry, cold weather
- Upper respiratory tract infections such as colds or flu
- Laughing or crying hard
- Allergens such as pollen, animal dander, dust, and dust mites, which are often concentrated on toys and home furnishings (e.g., stuffed toys, carpets, curtains, horizontal blinds), mold, and cockroach droppings
- Irritants such as tobacco smoke, cold air, strong odors, and chemical sprays (e.g., perfume, paint, cleaning solutions, lawn products, chalk dust)
- Weather changes

Physical Activity Participation

Identification, avoidance, and control of triggers, in conjunction with an asthma-management plan and appropriate asthma medications, allow children and adolescents with asthma to participate in physical activity. In some instances this may mean modifying physical activities to match the child's or adolescent's current asthma status.⁷ With effective management, even children and adoles-

cents with severe asthma can participate in a variety of physical activities, including competitive sports.⁶

Children and adolescents with asthma whose physical fitness status is good and whose asthma is well controlled respond to physical activity as their peers do; their maximal heart rate, breathing capacity, blood pressure, and work capacity stay within the normal range. In addition, children and adolescents with asthma who are physically active have fewer exacerbations of their condition, use less medication, and miss less school. Children and adolescents with asthma who are sedentary are at increased risk for exacerbations of their condition.⁹

Screening and Assessment

Asthma should be suspected when a child or adolescent has a history of coughing, shortness of breath, chest pain or tightness, wheezing, or lack of endurance associated with physical activity. An EIA diagnosis can be confirmed by conducting an exercise challenge test (e.g., treadmill, bicycle ergometer, free run, step test) and a set of pulmonary function tests before and after exercise. The test results should be interpreted by a physician. Children and adolescents with poorly controlled asthma will present with one or more of the following: persistent coughing, recurrent respiratory symptoms or complaints after participating in physical activity, reluctance to participate in physical activity, or a low stamina level.⁸

Counseling

Successful control of asthma requires a partnership among all adults involved in the care of the child or adolescent. The development of an asthma-management plan depends on the needs of each

child or adolescent. An asthma-management plan should include the following information: (1) a brief medical history, (2) common symptoms, (3) contact information for parents and health professionals, (4) asthma triggers, (5) best peak-flow measurement, (6) medications, and (7) a treatment plan.⁸

The type, length, or frequency of physical activity may have to be modified for a child or adolescent experiencing asthma symptoms or recovering from a recent asthma episode. Other modifications may include the following:^{6,7}

- Longer warm-up and cool-down periods, which may help prevent or decrease the severity of EIA episodes
- Identifying local resources to help modify physical activities
- Monitoring the environment and making adjustments to minimize asthma triggers
- Modifying activity intensity
- Focusing on helping children and adolescents participate in physical activity to the best of their ability
- Warming of the air (e.g., breathing through a scarf)
- Training and conditioning to prepare for physical activity
- Using prescribed medications to control and treat asthma symptoms triggered by physical activity

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Managing Albert's Exercise-Induced Asthma

Fourteen-year-old Albert Jackson and his parents have an appointment with Dr. Sheila Smith, their family physician, for Albert's annual health supervision visit. Before examining Albert, Dr. Smith asks him and his parents if they have any concerns they would like to discuss. Albert's parents tell her that Albert is doing well in school and has several close friends, but that he doesn't seem to have as much energy as other boys his age. "He gets out of breath easily," says Mrs. Jackson. "I asked his physical education teacher to excuse him when they play sports, because I don't want him to overexert himself."

Dr. Smith examines Albert and finds that he is healthy overall. However, after calculating his body mass index (BMI), she discovers that he is slightly overweight for his age and height. She asks him about his eating behaviors and learns that he eats a healthy diet that should allow him to maintain a healthy weight. She then asks, "What physical activities do you enjoy?"

"I don't play any sports," says Albert. "I wish I could play bas-

ketball and soccer, but when I play, I feel terrible. My chest hurts, like someone's sitting on it. I feel out of breath, and sometimes I cough a lot, too."

Dr. Smith tells Albert that she would like to do an airflow test (spirometry) and an exercise challenge test. "The tests will only take a few moments and won't be painful," she assures him. Albert agrees. Dr. Smith completes one set of pulmonary function tests and then asks Albert to do a step test using a small set of wooden steps she keeps in the office for this purpose. After completing the step test, Albert wheezes and becomes short of breath. His airflow measurements are considerably lower than they were before the tests.

Dr. Smith tells Albert and his parents that he appears to have exercise-induced asthma (EIA). She explains what EIA is and how to manage it. She reassures Albert's parents that his asthma is not severe and that he can safely participate in physical activity as long as his condition is properly managed. She says to Albert, "I can give you an inhaler that will

probably eliminate your symptoms. If that doesn't help, we can work together to find other ways to manage your condition so that you can enjoy participating in physical activity."

Albert and his parents meet in Dr. Smith's office after the examination. She brings an inhaler and shows Albert and his parents how to use it. She suggests that Albert use the inhaler before physical education class and before he participates in moderate or vigorous physical activity. Dr. Smith agrees to call Albert's physical education teacher to explain Albert's condition and develop an asthma-management plan. She encourages Albert's parents to talk to the teacher about school and community basketball and soccer teams Albert may wish to join. Albert leaves the office feeling happy and excited about being able to participate in physical activity like his classmates do.

FREQUENTLY ASKED QUESTIONS ABOUT PHYSICAL ACTIVITY AND ASTHMA

■ Will my child always have asthma?

Some children and adolescents outgrow asthma, but many don't. Children and adolescents with allergies or severe asthma are least likely to outgrow asthma. Asthma may disappear when children reach adolescence, when the size of the airways increases. However, asthma may return when they become adults.

■ My oldest child has asthma. Will my younger children develop it?

Asthma tends to run in families. However, the fact that your oldest child has asthma does not mean that your younger children will develop it. Children with allergies or eczema have a higher risk of developing asthma.

■ Can I do anything to prevent my child from having asthma attacks?

There are many steps you can take to reduce the chances of your child having an asthma attack. Have your child tested for allergies to identify triggers, and then try to eliminate them from your home. If your child is too young for testing and there is a family history of allergy, allergy-proofing the house may help. Do not allow smoking in your house. Exposure to tobacco smoke can increase the likelihood of asthma attacks.

■ My 9-year-old son has asthma. Should I let him participate in physical education classes?

Children and adolescents with asthma should be encouraged to participate in physical education classes and physical activities they enjoy. Some

children and adolescents with asthma may need to take medication in order to participate in physical activity. If your son has difficulty breathing during or after physical activity, talk to a health professional and his physical education teacher about developing an asthma-management plan that will allow him to participate in physical education classes.

■ Will asthma have any long-term effects on my child?

Asthma can cause lung damage if it is poorly controlled. Repeated episodes of asthma may affect your child's breathing capacity later in life. This can be avoided if asthma is properly controlled during childhood and adolescence.

Resources for Families

See Tool F: Physical Activity Resources for contact information on national organizations that can provide information on physical activity. State and local departments of public health and education and local libraries are additional sources of information.

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CHILDREN AND ADOLESCENTS WITH SPECIAL HEALTH CARE NEEDS

Children and adolescents with special health care needs have been defined as those “who have or are at increased risk for chronic physical, developmental, behavioral, or emotional conditions and who require health and related services of a type or amount beyond that required by children generally.”¹



Significance

Approximately 18 percent of children and adolescents in the United States have a chronic condition or disability.² The most common causes are respiratory diseases and mental impairments. Disabilities are most prevalent among boys, older children, and children from families with low incomes and from single-parent families.³ Disability in children and adolescents results in approximately 66 million days of restricted activity annually, 26 million physician contacts, 24 million days lost from school, and 5 million days in the hospital.³

Childhood and adolescent mortality resulting from chronic conditions and disabilities is declining; therefore, the population of adults with a chronic condition or disability will continue to increase. In general, cardiovascular disease risk factors are appearing much earlier in children and adolescents, physical fitness in children and adolescents is steadily decreasing, and the prevalence of childhood and adolescent obesity is increasing. In children and adolescents with special health care needs, a sedentary lifestyle is associated with an increased risk of morbidity. Preventive strategies are needed to help these children and adolescents increase their physical activity levels, which will help increase the length and improve the quality of their lives.

Physical Activity Benefits

Children and adolescents with special health care needs benefit from regular physical activity. It can make the tasks of daily living easier for them,



improve their health status, and ultimately reduce morbidity from secondary conditions during adulthood.

Physical activity for children and adolescents with special health care needs can⁴

- Help control or slow the progression of the chronic condition or disability, minimize its side effects, and reduce associated disabilities.
- Improve overall health and function.
- Minimize the psychological and social impact of the condition or disability on children and adolescents and their families, and help normalize their daily living experiences.

Issues and Concerns

Chronic conditions and disabilities range in severity from minor (i.e., no obvious signs of the condition or disability) to severe (i.e., multiple physical and psychological conditions or disabili-

ties). Medical advances are helping children and adolescents with special health care needs live longer. Promoting physical activity in early childhood can help children and adolescents improve their physical fitness, reduce the negative consequences of their condition or disability, and ultimately enhance their quality of life.

Health professionals need to counsel children and adolescents with special health care needs and their parents about the benefits and risks of participating in physical activity. The benefits and risks

vary depending on the child's or adolescent's condition or disability; however, in general, the benefits overwhelmingly outweigh the risks. Benefits include weight control, increased flexibility, and improved cardiovascular functioning. There are also psychological benefits, such as increased self-esteem and improved social skills. The benefits and risks of physical activity for children and adolescents with specific special health care needs are presented in Table 16.

Screening and Assessment

Children and adolescents with special health care needs vary in their ability to participate in physical activity. To select appropriate activities and duration, health professionals, along with children, adolescents, and parents, must consider the child's or adolescent's needs and concerns, as well as adaptations that may be needed for specific activities.

Individual screening and assessment should be conducted before a child or adolescent with special

Table 16. Benefits and Risks of Physical Activity for Children and Adolescents with Special Health Care Needs

Special Health Care Need	Description	Benefits	Risks
Cardiac disorders	Congenital or acquired structural defects in the heart and/or major blood vessels	<ul style="list-style-type: none"> ■ Improved cardiac and aerobic capacity ■ Enhanced peripheral circulation ■ Enhanced self-esteem 	<ul style="list-style-type: none"> ■ Physical activity intolerance as a result of underlying cardiac inefficiency
Cerebral palsy	Begins before, during, or shortly after birth, and may cause spasticity, weakness, athetosis (involuntary writhing-type movement of the limbs, trunk, and face), and ataxia (full or partial loss of fine motor control, balance, and equilibrium)	<ul style="list-style-type: none"> ■ Prevention or lessening of joint contracture ■ Improved ambulation and other motor function ■ Improved aerobic capacity ■ Strengthening of muscles ■ Enhanced self-esteem 	<ul style="list-style-type: none"> ■ Overuse disorders ■ Fatigue ■ Musculoskeletal injuries resulting from falls
Cystic fibrosis	An autosomal recessive disorder that causes blockages in ducts and air passages and affects the lungs, pancreas, intestinal mucous glands, and sweat glands; may cause skeletal abnormalities (digital clubbing, hypertrophic pulmonary osteoarthropathy), diminished aerobic capacity, and diminished muscle strength	<ul style="list-style-type: none"> ■ Improved respiratory muscle strength ■ Increased aerobic conditioning ■ Decreased mucous in airways ■ Enhanced self-esteem 	<ul style="list-style-type: none"> ■ Decreased oxygen levels in blood due to bronchoconstriction ■ Increased episodes of cough, shortness of breath, or salt and fluid loss leading to dehydration and heat-related illness

Table 16. Benefits and Risks of Physical Activity for Children and Adolescents with Special Health Care Needs (continued)

Special Health Care Need	Description	Benefits	Risks
Down syndrome	A genetic disorder in which there is an extra chromosome 21; characterized by distinct physical features and cognitive impairments; may be associated with congenital cardiac defects, usually septal defects	<ul style="list-style-type: none"> ■ Improved cardiac function and aerobic capacity ■ Decreased risk of obesity ■ Maintenance of muscle strength and endurance ■ Enhanced self-esteem 	<ul style="list-style-type: none"> ■ Possible physical activity intolerance in those with cardiac defect or underlying cardiac inefficiency ■ Musculoskeletal injuries resulting from obesity or skeletal problems (e.g., atlantoaxial instability, kneecap subluxation, hip dislocation)
Seizure disorder	Characterized by sudden, brief, and repetitive seizures	<ul style="list-style-type: none"> ■ Seizure prevention* ■ Improved ambulation and other motor function ■ Enhanced self-esteem 	<ul style="list-style-type: none"> ■ Low risk of exercise-induced seizures
Spina bifida	A congenital disorder of neural tube development whose impact may range from minimal (little motor dysfunction) to extreme (severe physical and cognitive impairment)	<ul style="list-style-type: none"> ■ Maintenance of muscle strength and endurance ■ Prevention of disuse atrophy ■ Decreased risk of obesity ■ Enhanced self-esteem 	<ul style="list-style-type: none"> ■ Overuse disorders ■ Musculoskeletal injuries resulting from falls

*Although only limited scientific evidence supports the concept that physical activity helps prevent seizures in children and adolescents with seizure disorder, regular physical activity has been associated with decreased seizure activity in children and adolescents in general.

Sources: Compiled from Goldberg,⁴ American Academy of Pediatrics, Committee on Sports Medicine and Fitness,^{5,6} and Proceedings of the 28th Bethesda Conference: Practice Guidelines and the Quality of Care.⁷

health care needs begins any physical activity. The cognitive abilities and social skills of the child or adolescent should be evaluated, and the impact of the special health care need and treatment on the

child's or adolescent's participation in any given activity should be taken into account. Activities may need to be adapted to help ensure that the child or adolescent has a positive experience partici-

Table 17. Screening and Assessment Guidelines for Children and Adolescents with Special Health Care Needs

Special Health Care Need	Screening and Assessment Guidelines
Cardiac disorders	<ul style="list-style-type: none"> ■ Complete assessment is crucial, especially for children and adolescents with a history of symptomatic heart disease. ■ Annual health examinations are required because of changes in hemodynamics, physical growth, and condition severity. ■ Physical activity testing, with monitoring of heart rate (using an electrocardiogram [ECG]) and blood pressure under conditions simulating the dynamic and static demands of the proposed activity, may be helpful.
Cerebral palsy	<ul style="list-style-type: none"> ■ Motor function and cognitive abilities need to be assessed. ■ Muscle tone and joint flexibility need to be assessed.
Cystic fibrosis	<ul style="list-style-type: none"> ■ Physical activity testing is strongly recommended for children and adolescents with severe lung disease (forced expiratory volume at 1 second [FEV1] < 50 percent or forced vital capacity [FVC] < 50 percent of predicted). ■ Increased salt intake should be encouraged. ■ Pulmonary status needs to be assessed during physical activity.
Down syndrome	<ul style="list-style-type: none"> ■ Motor function and cognitive abilities need to be assessed. ■ Children and adolescents with cardiac involvement need to be carefully assessed, especially if they have a history of symptomatic heart disease. Physical activity testing, with monitoring of heart rate (using an ECG) and blood pressure under conditions simulating the dynamic and static demands of the proposed activity, may be helpful. ■ Neck radiographs may be needed to screen for atlantoaxial instability.
Seizure disorder	<ul style="list-style-type: none"> ■ Motor skills and motor function, seizure history, history of seizure triggers (i.e., environmental, metabolic, or psychological stresses associated with previous seizure activity) need to be assessed.
Spina bifida	<ul style="list-style-type: none"> ■ Motor function and cognitive abilities need to be assessed. ■ Bracing (orthotics) needs to be assessed. ■ Hydration status needs to be assessed during physical activity, especially during hot weather.

Sources: Compiled from Goldberg,⁴ American Academy of Pediatrics, Committee on Sports Medicine and Fitness,^{5,6} and Proceedings of the 28th Bethesda Conference: Practice Guidelines and the Quality of Care.⁷

pating in them. Working together with the child or adolescent and parents is essential in order for the health professional to determine which level of participation is best. Table 17 provides guidelines for the screening and assessment of children and adolescents with special health care needs.⁵ These guidelines also include additional information related to physical activity participation.

Counseling

Health professionals need to promote physical activity in children and adolescents with special health care needs and their parents to help them adopt a physically active lifestyle. Physical activities that can be done together as a family (e.g., walking, biking, hiking) provide physiological and psychological benefits for children, adolescents, and parents.

Participation in physical activity with others (e.g., baseball, soccer) helps children and adolescents enhance their cognitive, creative, and motor skills. These activities are especially important for children and adolescents with special health care needs because they offer opportunities for them to socialize with their peers.

When children and adolescents with special health care needs participate in physical activity, they should be supervised by adults who are trained to work with them. Professional and volunteer organizations (e.g., Disabled Sports USA, National Sports Center for the Disabled) provide information on specific conditions and disabilities as well as information on appropriate physical activities and adaptations that may be needed (see Tool F: Physical



Activity Resources). Creative and collaborative strategies can enable children and adolescents with special health care needs to participate in physical activity (e.g., children and adolescents with Down syndrome playing baseball). Counseling strategies for children and adolescents with special health care needs are provided in Table 18.

Referral

Schools are an excellent community resource for families. To ensure that physical activity issues and concerns are addressed in the child's or adolescent's school, specific goals, objectives, and supports can be incorporated into their Individualized Education Plan (IEP). The IEP was established through Part B of the Individuals with Disabilities Education Act (IDEA).

Table 18. Counseling Strategies for Children and Adolescents with Special Health Care Needs

Special Health Care Need	Counseling Strategies
Cardiac disorders	<ul style="list-style-type: none"> ■ Children and adolescents with mild cardiac disorders do not need to restrict their physical activity, though they may need encouragement to become or remain physically active. ■ Children and adolescents with moderate to severe cardiac disorders (i.e., who experience symptoms daily) should be encouraged to participate in low-intensity physical activities (i.e., those with low static and dynamic demand). ■ Children and adolescents with cardiac disorders should not participate in competitive sports for 6 months to 1 year after heart surgery.
Cerebral palsy	<ul style="list-style-type: none"> ■ Strength training of specific muscle groups may reduce the effects of spasticity (e.g., decreased range of motion, fatigue). ■ Stretching and warm-up periods are important to increase flexibility. ■ Stretching needs to be done in a slow, sustained manner to avoid stimulating the stretch reflex.
Cystic fibrosis	<ul style="list-style-type: none"> ■ For children and adolescents with severe lung disease (FEV1 < 50 percent or FVC < 50 percent of predicted), blood oxygen concentrations should be assessed before participation in physical activity. ■ For children and adolescents with asthma in addition to cystic fibrosis, using a bronchodilator inhaler before participating in physical activity may prevent excess coughing and shortness of breath. ■ Digestive enzyme capsules must be taken with all meals. ■ Children and adolescents with cystic fibrosis who participate in physical activities more than 30 minutes in duration in hot weather need to drink water or fluids that contain electrolytes before, during, and after the activity and should always have access to salt and salty foods.
Down syndrome	<ul style="list-style-type: none"> ■ Physical activities may need to be adapted depending on the child's or adolescent's physical and cognitive abilities. ■ Precautions may be needed to protect children and adolescents with Down syndrome who have musculoskeletal problems or who are at risk for them. ■ For children or adolescents with cardiac disorders in addition to Down syndrome, guidelines listed under cardiac disorders need to be followed.

Table 18. Counseling Strategies for Children and Adolescents with Special Health Care Needs (continued)

Special Health Care Need	Counseling Strategies
Seizure disorder	<ul style="list-style-type: none"> ■ Adults supervising physical activities need training on how to handle seizures.
Spina bifida	<ul style="list-style-type: none"> ■ Stretching to increase flexibility is important. ■ Stretching and aerobic conditioning need to be followed by strength training.

Sources: Compiled from Goldberg,⁴ American Academy of Pediatrics, Committee on Sports Medicine and Fitness,^{5,6} and Proceedings of the 28th Bethesda Conference: Practice Guidelines and the Quality of Care.⁷

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FREQUENTLY ASKED QUESTIONS ABOUT PHYSICAL ACTIVITY AND CHILDREN AND ADOLESCENTS WITH SPECIAL HEALTH CARE NEEDS

■ **My son has cystic fibrosis. How often can he participate in physical activity?**

If your son's condition is stable, encourage him to participate in physical activity every day. Encourage him to try a variety of activities so he can find activities that he enjoys and that are appropriate for him. If your son participates in physical activity during hot weather, make sure he eats foods that contain extra salt (for example, saltines, pretzels, and sports drinks) and drinks more water. If your son also has severe lung disease (lung capacity below 50 percent), take him to a health professional specializing in special health care needs for physical activity testing to evaluate his ability to participate in physical activity.

■ **My daughter has a mild cardiac disorder. I'm worried about letting her participate in physical education. Should I ask that she be excused from the class?**

Most children and adolescents with special health care needs can safely participate in physical education classes. Children and adolescents with mild cardiac disorders can participate in most class activities (for example, running and playing volleyball). Even children and adolescents with moderate to severe cardiac disorders can participate in low-intensity activities. Take your daughter to a health professional regularly to have her health status assessed and receive guidance on an appropriate level of participation in physical activity. Discuss your daughter's condition, abilities, and any activity restrictions with the physical education teacher.

■ **My son, who has cerebral palsy, is about to start kindergarten. I'm afraid he'll get hurt playing with the other children. What should I do?**

It is important for your son's physical and emotional health that he play with his classmates. Discuss your son's condition with his teacher. Assure the teacher that your son can participate in most activities, although he may require some assistance, and tell the teacher that he needs adult supervision when he is on playground equipment such as slides and climbing equipment. Discuss risks, injury prevention strategies, and how to handle emergencies.

■ **My daughter has Down syndrome and wants to join a community baseball team. Is this OK?**

If your daughter has no cardiac problems, she can safely participate in most physical activities. Participation in physical activity with others (for example, baseball and soccer) helps children and adolescents enhance their cognitive, creative, and motor skills. These activities are especially important for children and adolescents with special health care needs because they offer opportunities for them to socialize with their peers. Discuss your daughter's condition with the coach and provide written materials on her condition if possible.

Resources for Families

See Tool F: Physical Activity Resources for contact information on national organizations that can provide information on physical activity. State and local departments of public health and education and local libraries are additional sources of information.

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DEVELOPMENTAL COORDINATION DISORDER

Our ability to coordinate movements so that we can button our shirts or tie our shoelaces is often taken for granted. But performing these seemingly simple tasks may be daunting for a child or adolescent with motor coordination problems.

Mild to moderate motor coordination problems may accompany a range of disorders, including learning disorders (particularly nonverbal learning disorder), attention-deficit/hyperactivity disorder, and various congenital problems (e.g., premature birth, low birthweight, mental retardation).

Motor coordination problems may also occur in children and adolescents who have no obvious physical or mental impairments. These children and adolescents have been classified as having developmental dyspraxia, minimal cerebral dysfunction, or sensory integration problems. The American Psychiatric Association classifies these children and adolescents as having developmental coordination disorder (DCD), defined as “marked impairment in the development of motor coordination.”¹ It is estimated that 6 percent of children ages 5 to 11 in the United States have DCD.¹

There is no consensus whether DCD is a physiological or developmental disorder or, if the disorder is physiological, whether it is multisensory or unisensory. Children and adolescents with DCD may have problems with gross motor skills, fine motor skills, or both. Some have difficulty planning movements (dyspraxia) and executing them, others have difficulty planning movements but not executing them, and others have difficulty executing movements but not planning them.

Children and adolescents with DCD should not be confused with those who do not perform motor skills as well as their peers. Rather, children and adolescents with DCD have extreme difficulty acquiring new motor skills. Practice can help them, but it must be structured in specific ways to be effective. Motor skill development is slow for children and adolescents with DCD, and perceptual motor skills that are complex and/or require precise perception, such as writing between the lines on a sheet of paper, can be very difficult.

Significance

Children and adolescents with motor coordination problems are at risk for low academic performance, poor self-esteem, and inadequate physical activity participation. Unless there is intervention, their problems are likely to continue through adolescence. These children and adolescents are likely to avoid physical activity and experience frustration if they are forced to participate. Motor coordination problems do not resolve themselves, and children and adolescents do not outgrow them.²

Children and adolescents with motor coordination problems are usually underactive throughout their school years and may not attain even moderate levels of proficiency in most types of physical activities. DCD, particularly when combined with other problems, is rarely identified until a child is at least 8 years old. The disorder often goes undiagnosed. One reason for this is that motor coordination problems manifest themselves in many ways, some of which are considered normal. For example, tripping and falling are not



uncommon in young children and often go unremarked. Not catching a ball in a baseball game or striking out repeatedly may be attributed to lack of practice rather than to difficulty learning motor skills. Therefore, unless children and adolescents are severely affected (particularly in fine motor skills such as those needed for handwriting), usually neither parents nor school personnel perceive the child's or adolescent's poor coordination as a problem that needs special attention.

Physical Activity Supervision

Children and adolescents with DCD have no physiological barriers to being physically active. Therefore, health professionals can follow the physical activity screening and assessment guidelines listed in the Early Childhood, Middle Childhood,

and Adolescence chapters. But health professionals need to keep in mind that children and adolescents with motor coordination problems, whether or not they have been diagnosed with DCD (or developmental dyspraxia, minimal cerebral dysfunction, or sensory integration problems), probably have psychological barriers that keep them from being physically active.

Interview Questions

Children in early childhood (ages 1–4) whose gross motor skills and fine motor skills (e.g., those used for running, climbing, and drawing and for self-care activities such as dressing, tying shoelaces, and buttoning shirts) develop later than usual may have DCD.

Interview Questions for the Parent

Does your child avoid physical activity?

Does your child feel uncomfortable when participating in group physical activities? If so, which ones?

Does your child often trip, fall down, or bump into things?

Children in middle childhood (ages 5–10) who avoid physical activities that require hand-eye coordination, or who experience difficulty with handwriting, catching or throwing a ball, balancing on one foot, or riding a bike, may have DCD.

Interview Questions for the Child

What do you like about physical education class at school? What do you dislike?

What is your favorite type of physical activity (for example, sports, dancing, or games)?

Do you participate in any of these activities with your friends or family? Do you think you are good at any of them?

Do you think you are as good at physical activities as other children your age?

Do you ever get frustrated when participating in physical activities with your friends?

Adolescents (ages 11–21) who avoid or never participate in physical activity with others or whose motor skill performance is below that of their peers may have DCD. Games and organized sports highlight their difficulties. They become frustrated and avoid activities that require motor skills.

Interview Questions for the Adolescent

What do you like about physical education class at school? What do you dislike?

What is your favorite type of physical activity (for example, sports, dancing, or games)?

Do you participate in any of these activities with your friends or family? Do you think you are good at any of them?

Do you think you are as good at physical activities as other adolescents your age?

Do you ever get frustrated when participating in physical activities with your friends?

Counseling

Health professionals can help children and adolescents with DCD increase their physical activity levels and develop behaviors that will help them remain physically active throughout their lives by encouraging them to participate in activities that

they enjoy and that do not require much hand-eye coordination or the ability to focus their attention. These activities include hiking, running, biking, skating, swimming, yoga, aerobic exercise, and some types of martial arts such as tai chi.

Children and adolescents with DCD and their families need to know that motor coordination problems will not disappear with time or without special effort. The most successful intervention strategies are those that are developmentally appropriate and that involve small incremental challenges. It is important to identify physical activities that children and adolescents with DCD enjoy and can continue to participate in throughout their lives.

Children and adolescents with DCD usually have low self-esteem. Competitive activities should be avoided. Emphasis should be placed on finding activities in which these children and adolescents can succeed.

Referral

Schools are an excellent community resource for families. To ensure that physical activity issues and concerns are addressed in the child's or adolescent's school, specific goals, objectives, and supports can be incorporated into their Individualized Education Plan (IEP). The IEP was established through Part B of the Individuals with Disabilities Education Act (IDEA).

Children and adolescents whose motor coordination problems make it difficult for them to function at home or at school should be referred to a health professional, such as a pediatric neurologist, to rule out neurological problems (e.g., cerebral palsy), and to an occupational therapist for treatment.

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FREQUENTLY ASKED QUESTIONS ABOUT PHYSICAL ACTIVITY AND DEVELOPMENTAL COORDINATION DISORDER

- **My 6-year-old daughter is having problems performing tasks that require coordination, such as buttoning, tying shoelaces, and using scissors. Will she outgrow these problems?**

Children develop motor skills at different rates. Some children need more time and experience to improve their skills. However, not all children outgrow their coordination problems. Take your daughter to a physician for evaluation.

- **My son seems clumsy compared to other children his age. Why is this?**

Motor coordination varies widely among children and adolescents. For those with motor coordination problems, instruction and practice may help. If these do not help your son, take him to a physician for evaluation. If necessary, your son will be referred to a specialist who can administer standardized neurological and psychomotor tests to diagnose motor coordination problems.

- **My daughter has developmental coordination disorder. I enrolled her in an after-school physical activity program, but her motor skills have not improved. What should I do?**

Children and adolescents with developmental coordination disorder have difficulty improving their motor skills, even with instruction and practice. If your daughter is enjoying the program, keep her in it; otherwise, try another program or activity. Participation in physical

activities in which your daughter succeeds can help her build self-confidence.

- **My 8-year-old son has trouble getting dressed in the morning. He's still struggling with his buttons and shoelaces when everyone else is ready to go. I want him to do these things for himself, but the family is losing patience. What can I do?**

The time to practice buttoning and shoelace tying is not when everyone is in a hurry. A child who is having difficulty with these motor tasks usually gets more flustered under pressure. Buy your son pullover tops, pants without buttons, and slip-on shoes or those with Velcro fasteners, and help him practice buttoning and shoelace tying skills after school, in the evenings, or on weekends.

- **My daughter can't keep up with writing assignments at school. She knows what she wants to write but has trouble with her handwriting. What can I do to help her?**

Handwriting, which requires hand-eye coordination, is very challenging for some children, particularly those with motor coordination problems. Ask your daughter's teacher to give her more time to finish assignments, and encourage her to practice handwriting at home. If additional assignment time and practice do not help, ask the teacher or school counselor for a referral to a specialist, such as an occupational therapist, for help.

Resources for Families

See Tool F: Physical Activity Resources for contact information on national organizations that can provide information on physical activity. State and local departments of public health and education and local libraries are additional sources of information.

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DIABETES MELLITUS

Diabetes mellitus is a chronic disease in which the body does not produce or properly use insulin. The body requires insulin, a hormone manufactured by the beta cells of the pancreas, to maximally use glucose from digested food as an energy source. Diabetes mellitus is characterized by elevated glucose in the blood and sometimes urine. The goal of treatment is to manage the factors that affect blood glucose levels (e.g., insulin, food, physical activity) to promote near-normal levels. Although the exact cause of diabetes is not known, a genetic component to the disease is recognized, and environmental and immunologic factors may also play roles.

There are two types of diabetes mellitus. In type 1 diabetes mellitus, the body does not produce any insulin, and daily insulin injections are required. Type 1 occurs in infants, children, adolescents, and young adults and accounts for 5 to 10 percent of all cases of diabetes mellitus.¹ In contrast, persons with type 2 diabetes mellitus produce insulin, but the body is unable to make enough or properly use what is made.

Type 2 diabetes mellitus is typically diagnosed after the age of 40 and accounts for 90 to 95 percent of all cases; however, because of the increasing prevalence of obesity, the number of children, adolescents, and young adults with type 2 is increasing. Treatment of type 2 diabetes mellitus includes lifestyle changes to promote a healthy weight and regular physical activity, as well as oral medications or supplemental insulin if needed. Prevention of type 2 also involves the promotion of a healthy weight and regular physical activity to improve car-

bohydrate metabolism and insulin sensitivity. (See the Obesity chapter.)

Significance

Nearly 16 million people in the United States have diabetes mellitus; it affects 123,000 children and adolescents under age 20.² The quality of care that children and adolescents receive may affect their long-term health. Control of diabetes mellitus aims to prevent acute complications (e.g., diabetic ketoacidosis and severe hypoglycemia, both of which can be life threatening) and chronic microvascular and macrovascular complications, which can lead to blindness, kidney disease, nerve damage, amputation, heart disease, and stroke.



Screening

No screening recommendations for the diagnosis of diabetes mellitus in children or adolescents with type 1 have been established. During the early course of type 1 diabetes mellitus, children and adolescents may present with symptoms of polyuria (excessive urination), polydipsia (excessive thirst), polyphagia (excessive appetite), and weight loss. At this time, a random blood glucose level greater than or equal to 200 mg/dL (11.1 mmol/L) or a fasting plasma glucose greater than or equal to 126 mg/dL (7.0 mmol/L) is sufficient to make the diagnosis.³ Early diagnosis reduces the risk of more dangerous conditions (e.g., increased weight loss, dehydration, diabetic ketoacidosis).

Management

Children and adolescents with diabetes mellitus should be encouraged to participate in physical activity in order to maintain good health. Participating in physical activity helps them (1) increase energy expenditure and obtain and maintain a healthy body weight, (2) preserve or increase muscle mass, (3) normalize blood lipid levels, and (4) become more sensitive to insulin and therefore be able to function with less insulin. With careful guidance, and if their condition is managed properly, most children and adolescents with diabetes can safely participate in physical activity. However, because their blood glucose levels may vary considerably when they participate in physical activity, it is particularly important for them to learn to control their glucose levels.

Children and adolescents with diabetes mellitus who are physically active need to do the following:

- Before beginning an organized physical activity program, have a thorough health examination.

- Always wear medical identification.
- Wear supportive shoes and cotton socks, and check feet for blisters and cuts regularly.

Parents need to ensure that the adult supervising an organized physical activity program understands diabetes and knows the warning signs of hypoglycemia as well as how to prevent it.

Children and adolescents with diabetes should not participate in physical activity if

- Retinal (eye) hemorrhages are present.
- They are ill or have an infection.
- Their blood glucose level is 100 mg/dL or less. Before participating in physical activity, children and adolescents with diabetes and low blood glucose levels need to consume foods high in carbohydrates based on the estimated intensity and duration of the physical activity.
- Their blood glucose level is 250 mg/dL or greater and urine ketones are present, or their blood glucose level is greater than 300 mg/dL and no ketones are present. Children and adolescents with diabetes and elevated blood glucose levels need to decrease their blood glucose level before beginning physical activity. Participating in physical activity when ketones are present may increase the ketones and in turn increase the risk of diabetic ketoacidosis. Children and adolescents with diabetes need to drink extra fluids to reduce ketones.

Once it has been determined that it is safe for a child or adolescent with diabetes to participate in physical activity, it is important for all adults involved (e.g., classroom teachers, school nurses, school counselors, physical education teachers, coaches) to know that the child or adolescent has diabetes, know the

signs of hypoglycemia, and know what to do if hypoglycemia occurs. School administrators need to inform substitute teachers if they will have a child or adolescent with diabetes in their class.

A sample diabetes care record for children and adolescents with diabetes appears at the end of this chapter (Figure 2). Health professionals should provide school personnel with these records.

Insulin

It is important for health professionals to provide children, adolescents, and their parents with the information they need to understand diabetes and how the timing of insulin injections affects blood glucose levels. This will allow the child or adolescent to participate in physical activity while preventing the blood glucose level from becoming abnormally low or high.

Children and adolescents with diabetes who are physically active must do the following:

- Check blood glucose levels several times a day, including before and after physical activity, and during the activity if it is more than 30 minutes in duration.
 - Adjust insulin dosage to compensate for the effect of physical activity on blood glucose levels: (1) decrease insulin doses on days when the child or adolescent expects to be more active than usual, and (2) decrease insulin doses or consume foods high in carbohydrates when physical activity occurs late in the evening, to reduce the risk that blood glucose levels will fall abnormally low during the night.
 - Consider the timing of insulin action (e.g., rapid-acting, short-acting, intermediate-acting, and long-acting insulin) in relation to physical activity.
- Inject insulin into a part of the body that will not be engaging in vigorous physical activity, because physical activity increases blood flow to the part of the body that is moving, and the increase in blood flow depletes insulin faster. For example, if a child or adolescent will be playing tennis, insulin should not be injected into the racquet arm. The abdomen is a good site in which to inject insulin on vigorous physical activity days.
 - Learn their blood glucose response to different types of physical activity.

Oral Hypoglycemic Agents

Although limited research has been conducted with children and adolescents using oral hypoglycemic agents (OHAs), they are increasingly being used to treat type 2 diabetes mellitus in children and adolescents. OHAs are oral medications that help lower and control blood glucose levels. It is important for teachers and coaches to know that a child or adolescent is taking this type of medication. An increase in the child's or adolescent's physical activity level may decrease the need for such agents. Participating in vigorous physical activity may also cause hypoglycemia in children or adolescents taking OHAs.

Nutrition

Proper nutrition is critical for physically active children and adolescents with diabetes mellitus. It is important for children, adolescents, and parents to understand appropriate food choices and the timing of meals and snacks; what and when the child or adolescent needs to eat before, during, or after physical activity; and when to eat in relation to physical activity that takes place at school.

Children and adolescents with diabetes must adjust their food intake when necessary. They may need to eat a snack before participating in physical activity, particularly if the physical activity comes immediately before lunch or at the end of the day.

Children and adolescents with diabetes who are physically active need to do the following:

- Consume foods high in carbohydrates to avoid hypoglycemia.
- Keep foods high in carbohydrates (e.g., cereal bars, peanut butter and crackers, cheese and crackers) available. Physical education teachers and coaches should have appropriate foods and allow the child or adolescent to eat if necessary.
- Drink extra fluids before, during, and after physical activity.
- Carry a source of quick-absorbing carbohydrates (e.g., hard candy, sports drinks, glucose tablets).

Medical Identification

It is essential that children and adolescents with diabetes carry medical identification at all times. The best choice may be a necklace or bracelet that is linked to a computer network that lists the child's or adolescent's name, parents' names, and emergency numbers, as well as current medications. This will allow emergency personnel to contact parents even if the child or adolescent is unconscious.



Many teachers and coaches do not permit children and adolescents to wear jewelry during physical activity. A health professional may need to insist that the child or adolescent be allowed to wear medical identification jewelry while participating in physical activity. Health professionals should explain that children and adolescents with diabetes are at greater health risk if they do not wear medical identification jewelry.

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Helping Sarah Manage Her Diabetes and Play Basketball

Sarah Taylor is an active 14-year-old who loves to play basketball. One afternoon, she rushes home from school to tell her parents that she wants to try out for the basketball team. The coach has seen Sarah play basketball with her classmates and thinks that she could become a good player. Sarah's parents are happy for their daughter but also concerned. Sarah was diagnosed with diabetes 6 months ago. It took the family almost 2 months to learn how to balance her food intake and insulin dose to keep her blood glucose in a healthy range. If Sarah decides to play basketball, it could mean that the family would have to change its routine again.

Sarah's parents call their physician, Dr. Kao, for advice. They ask how risky it would be for Sarah to play on a basketball team and how it could affect her insulin levels. Dr. Kao assures them that adolescents with diabetes should participate in regular physical activity to help optimize the course of their diabetes. He reassures them that with appropriate self-care, adoles-

cents with diabetes can participate in many types of organized sports, including basketball. Dr. Kao suggests that Sarah and her parents come in for a visit if she makes the basketball team.

Sarah makes the team, and her parents reluctantly agree to let her play if she learns how to adjust her food intake and insulin dose. At the diabetes clinic, members of the health care team show Sarah and her parents how to monitor her blood glucose level to learn how physical activity will affect it, and how to treat a low-blood-glucose reaction (hypoglycemia). Sarah is taught to carry fast-acting carbohydrate snacks and glucose to consume if she becomes hypoglycemic. Her eating schedule is altered to include a snack before and after each practice and game. Sarah also learns how to choose appropriate foods from fast-food and other restaurants when her team travels, and she is advised that post-exercise hypoglycemia may occur 4 to 10 hours after unusually intense or long practices. The health care team suggests that Sarah and her parents talk with

the coach about Sarah's special health care needs, and that the coach be taught how to identify and treat hypoglycemia. The health care team asks Sarah to schedule a follow-up visit.

During the follow-up visit, Sarah reports that she is doing well. It took a couple of weeks for her to learn what types of pregame snacks she needs to keep her blood glucose levels from dropping too low, but she has not had a low-blood-glucose reaction since the second week of practice. She is excited to share that she has been picked as a starting player for the team.

Figure 2. Diabetes Mellitus Care School Record

Diabetes Mellitus Care School Record

Date: _____

Name: _____

Mother's name: _____

Home phone: _____

Work phone: _____

Other: _____

Father's name: _____

Home phone: _____

Work phone: _____

Other: _____

Other Emergency Contacts

Name: _____

Phone: _____

Name: _____

Phone: _____

Health Professional

Name: _____

Phone: _____

Diabetes Medications

Insulin

Can child/adolescent give own injections?

Yes No

Types taken: _____

Usual injection times: _____

Oral Hyperglycemic Agents

Name and dose: _____

Other Medications

Name and dose: _____

Name and dose: _____

Blood Glucose Level

Can child/adolescent do own blood glucose tests?

Yes No

Target range: _____

Usual times for testing: _____

Times for additional testing: _____

Type of blood glucose meter used: _____

Notify parents in the following situations:

Meals and Snacks

When does the child/adolescent eat the following meals and snacks?

Breakfast: _____

Midmorning snack: _____

Lunch: _____

Midafternoon snack: _____

Dinner: _____

Evening snack: _____

Snacks before or after physical activity: _____

Other snacks: _____

Preferred snack foods: _____

Foods to avoid: _____

Physical Activity

Regular activities: _____

Restrictions on activity: _____

Child/adolescent should not participate in physical activity if blood glucose level is

- 100 mg/dL or less. (Provide carbohydrate snack.)
- 250 mg/dL and ketones are present.
- Greater than 300 mg/dL or greater and no ketones are present.

Hypoglycemia (Low Blood Glucose Level)

Usual symptoms: _____

Preferred foods for treating hypoglycemia: _____

Designated school personnel for administering glucagon: _____

In Case of Emergency

Location of diabetes care supplies: _____

Location of snacks: _____

FREQUENTLY ASKED QUESTIONS ABOUT PHYSICAL ACTIVITY AND DIABETES MELLITUS

- **My son has type 1 diabetes mellitus and has physical education class right before lunch. What should he do?**

Your son may need to eat a small snack (for example, a cereal bar, peanut butter and crackers, or cheese and crackers) just before physical education class. For the first couple of days of school, he needs to check his blood glucose level before and after physical education class to determine how large a snack he needs. Send a letter informing the physical education teacher that your son has to eat a snack before class and may, on occasion, be late for class because of this. Make sure that your son carries medical identification or wears medical identification jewelry at all times and that his physical education teacher and other school personnel are aware that he has diabetes mellitus and know what to do in case of emergency.

- **My daughter, who has diabetes, has basketball practice at dinnertime. What should she do?**

The time of the practice should not prevent your daughter from participating in basketball. It may be helpful for her to eat a larger-than-normal afternoon snack (almost a small meal) before practice and then a small dinner immediately after. She should also have a regular bedtime snack. On practice days, she may need to check her blood glucose level more frequently and adjust her food intake or insulin dose.

- **A boy on the soccer team I coach has type 1 diabetes. What are the signs of hypoglycemia?**

Some signs of hypoglycemia (low blood glucose) are shakiness, disorientation, irritability, cold sweat, and lightheadedness. The best way to prevent low blood glucose is to have the boy check his blood glucose level before, during (such as at halftime), and immediately after games and practices to see if he needs to eat a snack. If his blood glucose level is low, he needs to eat or drink foods high in carbohydrates (for example, fruit or fruit juice).

- **Sometimes my daughter's blood glucose level drops when she participates in physical activity. What foods should she eat when this happens?**

Your daughter needs to consume high-carbohydrate foods that are easy to absorb (for example, fruit juices, sports drinks, hard candy, or glucose tablets). Glucose tablets are available in most drug stores.

- **My mother is overweight and has type 2 diabetes mellitus. My daughter is overweight too. Will she get diabetes?**

Your daughter is at an increased risk for developing type 2 diabetes mellitus because of a family history of the disease, but this does not necessarily mean she will develop it. The best way to decrease her risk is to ensure that she eats healthy foods, maintains a healthy weight, and participates in moderate physical activity for 30 minutes or more on most, if not all, days of the week.

Resources for Families

See Tool F: Physical Activity Resources for contact information on national organizations that can provide information on physical activity. State and local departments of public health and education and local libraries are additional sources of information.

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EATING DISORDERS

Unhealthy eating behaviors and preoccupation with body size can lead to life-threatening eating disorders (e.g., anorexia nervosa, bulimia nervosa) described in the *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition, text revision (DSM-IV-TR).^{1,2} (DSM-IV criteria for anorexia nervosa, bulimia nervosa, and eating disorders not otherwise specified follow on pages 119 and 120.) Many children and adolescents with eating disorders participate in excessive physical activity to control their weight.³ Some become anxious or depressed if they are unable to participate in physical activity.⁴

Significance

Eating disorders have been observed in both sexes and across socioeconomic and racial/ethnic groups. The prevalence of anorexia nervosa and bulimia nervosa is thought to be 1 to 2 percent among female adolescents. Estimates of mortality resulting from anorexia nervosa vary considerably. The average estimate is 5 to 8 percent, but some estimates are as high as 20 percent.^{5,6} Death may be due to cardiac arrhythmia (irregular heartbeat), acute cardiovascular failure, gastric hemorrhaging, or suicide. The major medical complications observed in children and adolescents with anorexia nervosa include the following:⁷

- Cardiac arrhythmia
- Dehydration and electrolyte imbalances
- Delayed growth and development
- Endocrinological disturbances (e.g., menstrual dysfunction, hypothermia)



- Gastrointestinal problems
- Oral health problems (e.g., enamel demineralization, salivary dysfunction)
- Osteopenia, osteoporosis
- Protein/calorie malnutrition and its consequences

Bulimia nervosa can damage teeth. Purging exposes the teeth to acidic vomitus, which demineralizes tooth enamel and slowly dissolves the teeth. Health professionals should refer children and adolescents to a dentist if tooth damage is apparent. With bulimia nervosa, enlargement of the parotid glands may also be present.

Diagnostic Criteria for 307.1 Anorexia Nervosa

- A. Refusal to maintain body weight at or above a minimally normal weight for age and height (e.g., weight loss leading to maintenance of body weight less than 85% of that expected; or failure to make expected weight gain during period of growth, leading to body weight less than 85% of that expected).
- B. Intense fear of gaining weight or becoming fat, even though underweight.
- C. Disturbance in the way in which one's body weight or shape is experienced, undue influence of body weight or shape on self-evaluation, or denial of the seriousness of the current low body weight.
- D. In postmenarcheal females, amenorrhea, i.e., the absence of at least three consecutive menstrual cycles. (A woman is considered to have amenorrhea if her periods occur only following hormone, e.g., estrogen, administration.)

Specify type:

Restricting Type: During the current episode of Anorexia Nervosa, the person has not regularly engaged in binge-eating or purging behavior (i.e., self-induced vomiting or the misuse of laxatives, diuretics, or enemas).

Binge-Eating/Purging Type: During the current episode of Anorexia Nervosa, the person has regularly engaged in binge-eating or purging behavior (i.e., self-induced vomiting or the misuse of laxatives, diuretics, or enemas).

Diagnostic Criteria for 307.51 Bulimia Nervosa

- A. Recurrent episodes of binge eating. An episode of binge eating is characterized by both of the following:
 - (1) eating, in a discrete period of time (e.g., within any 2-hour period), an amount of food that is definitely larger than most people would eat during a similar period of time and under similar circumstances
 - (2) a sense of lack of control over eating during the episode (e.g., a feeling that one cannot stop eating or control what or how much one is eating)
- B. Recurrent, inappropriate compensatory behavior in order to prevent weight gain, such as self-induced vomiting; misuse of laxatives, diuretics, enemas, or other medications; fasting; or excessive exercise.
- C. The binge eating and inappropriate compensatory behaviors both occur, on average, at least twice a week for 3 months.
- D. Self-evaluation is unduly influenced by body shape and weight.
- E. The disturbance does not occur exclusively during episodes of Anorexia Nervosa.

Specify type:

Purging Type: During the current episode of Bulimia Nervosa, the person has regularly engaged in self-induced vomiting or the misuse of laxatives, diuretics, or enemas.

Nonpurging Type: During the current episode of Bulimia Nervosa, the person has used other inappropriate compensatory behaviors, such as fasting or excessive exercise, but has not regularly engaged in self-induced vomiting or the misuse of laxatives, diuretics, or enemas.

Diagnostic Criteria for 307.50 Eating Disorder Not Otherwise Specified

The Eating Disorder Not Otherwise Specified category is for disorders of eating that do not meet the criteria for any specific Eating Disorder. Examples include

1. For females, all of the criteria for Anorexia Nervosa are met except that the individual has regular menses.
2. All of the criteria for Anorexia Nervosa are met except that, despite significant weight loss, the individual's current weight is in the normal range.
3. All of the criteria for Bulimia Nervosa are met except that the binge eating and inappropriate compensatory mechanisms occur at a frequency of less than twice a week or for a duration of less than 3 months.
4. The regular use of inappropriate compensatory behavior by an individual of normal body weight after eating small amounts of food (e.g., self-induced vomiting after the consumption of two cookies).
5. Repeatedly chewing and spitting out, but not swallowing, large amounts of food.
6. Binge-eating disorder: recurrent episodes of binge eating in the absence of the regular use of inappropriate compensatory behaviors characteristic of Bulimia Nervosa.

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Screening and Assessment

Early identification of children and adolescents with eating disorders may be linked to better long-term outcomes. However, it can be difficult to identify children and adolescents who have eating disorders or who are at high risk for developing such disorders, because they may (1) avoid medical visits; (2) present with gastrointestinal problems, amenorrhea, or sports injuries; or (3) seek assistance only with weight loss. Health professionals should suspect an eating disorder if parents seek medical help for their child or adolescent because of unexplained weight loss or suspicion of self-induced vomiting.

Screening

Eating disorder screening can be incorporated into health supervision visits or sports preparticipation physical examinations. In addition to conduct-

ing an examination (which includes determining body mass index [BMI]), health professionals need to (1) obtain the child's or adolescent's health history, (2) obtain information on body image and eating and physical activity behaviors, and (3) administer a brief psychosocial assessment. If any warning signs are present (Tables 19 and 20), health professionals need to evaluate further, using the information in the Assessment section, which follows.

The presence of a warning sign does not always indicate that a child or adolescent has an eating disorder. Physically active children and adolescents who do not have an eating disorder may also experience gastrointestinal problems, dizziness, and menstrual irregularities and practice unhealthy eating behaviors. Health professionals who have experience providing care for children and adolescents with eating disorders can help distinguish typical eating and physical activity behaviors from an eating disorder.⁸

Table 19. Anorexia Nervosa: Screening Elements and Warning Signs

Screening Elements	Warning Signs
Body Image	<ul style="list-style-type: none"> ■ Distorted body image ■ Extreme dissatisfaction with body shape or weight ■ Profound fear of gaining weight or becoming fat
Eating and Related Behaviors	<ul style="list-style-type: none"> ■ Very low caloric intake ■ Fasting or restrictive dieting ■ Denial of hunger cues ■ Erratic meal patterns or frequent meal skipping ■ Poor appetite ■ Difficulty eating in front of others ■ Food seen as good or bad
Health History/Examination	<ul style="list-style-type: none"> ■ BMI less than 20th percentile ■ Unexplained weight change ■ Amenorrhea ■ Fainting episodes or frequent lightheadedness ■ Constipation or diarrhea ■ Bloating/nausea ■ Hypothermia; cold intolerance ■ Orthostatic hypotension (greater than 10 mm Hg after posture changes) ■ Bradycardia (resting heart rate of 60 beats/minute or less)
Physical Activity Behaviors	<ul style="list-style-type: none"> ■ Participation in physical activity with weight or size requirement (e.g., gymnastics, wrestling, ballet) ■ Overtraining or compulsive attitude about physical activity
Psychosocial	<ul style="list-style-type: none"> ■ Depressed affect ■ Frequent thoughts about food or weight ■ Feeling pressure from others to be a certain shape or weight ■ Perfectionist ■ History of physical or sexual abuse or other traumatizing life event

Sources: Perkins et al.,⁹ Adams and Shafer,¹⁰ and American Medical Association.¹¹

Table 20. Bulimia Nervosa: Screening Elements and Warning Signs

Screening Elements	Warning Signs
Body Image	<ul style="list-style-type: none"> ■ Distorted body image ■ Extreme dissatisfaction with body shape or weight ■ Profound fear of gaining weight or becoming fat
Eating and Related Behaviors	<ul style="list-style-type: none"> ■ Wide variations in caloric intake ■ Fasting or restrictive dieting (episodic) ■ Binge eating ■ Unexplained disappearance of large quantities of food ■ Denial of hunger cues ■ Erratic meal patterns or frequent meal skipping ■ Poor appetite ■ Difficulty eating in front of others ■ Food seen as good or bad
Health History/Examination	<ul style="list-style-type: none"> ■ Unexplained weight change or fluctuations greater than 10 lbs ■ Irregular menses ■ Constipation or diarrhea ■ Bloating/nausea/abdominal pain ■ Dental caries ■ Orthostatic hypotension (changes greater than 10 mm Hg after posture changes)
Physical Activity Behaviors	<ul style="list-style-type: none"> ■ Participation in physical activity with weight or size requirement (e.g., gymnastics, wrestling, ballet) ■ Overtraining or compulsive attitude about physical activity
Psychosocial	<ul style="list-style-type: none"> ■ Depressed affect ■ Frequent thoughts about food or weight ■ Feeling pressure from others to be a certain shape or weight ■ Perfectionist ■ History of physical or sexual abuse or other traumatizing life event

Sources: Perkins et al.,⁹ Adams and Shafer,¹⁰ and American Medical Association.¹¹

Medical History and Physical Assessment

If the child or adolescent is at high risk for an eating disorder (based on the warning signs listed in Tables 19 and 20), a number of assessments should be performed in addition to the initial screening. These assessments are best done by an interdisciplinary team of health professionals working together to evaluate the child or adolescent at high risk:

- Rule out organic illness as an explanation for weight loss or menstrual abnormalities.
- Ask about history of binge eating and/or compensatory behaviors (e.g., self-induced vomiting; laxative, diuretic, or diet pill use; excessive physical activity). If the child or adolescent has diabetes mellitus with elevated H_bA_{1c} levels, evaluate the possibility of insulin withholding as a means of weight control.
- Assess for orthostatic changes in pulse and blood pressure.
- Keep in mind that results of laboratory tests are not definitive markers for diagnosing the presence of eating disorders. Children and adolescents with eating disorders often have results within the normal range when assessed with the following tests:
 - *Amylase*. Serum amylase is elevated in some children and adolescents who vomit regularly.
 - *Calcium and magnesium*. Hypocalcemia (decreased calcium in the blood) and hypomagnesemia (decreased magnesium in the blood) may be observed with laxative abuse, malnutrition, and inadequate dietary intake.

- *Potassium*. Hypokalemia (decreased potassium in the blood) may be observed with prolonged malnutrition or purging.
 - *Urine ketones*. These compounds may be elevated because of chronic fasting or inadequate food intake.
 - *Urine-specific gravity*. This measurement may be elevated (suggesting dehydration) or may be low because of excessive fluid intake.
- Assess the need for hospitalization.¹¹ (See the Referral and Treatment section.)

Nutrition Assessment

- Take the child's or adolescent's health and weight history, including history of binge eating or purging (e.g., self-induced vomiting; laxative or diuretic use). Some children and adolescents do not want to talk about their eating and physical activity behaviors and are more likely to answer health-focused questions phrased in a supportive, nonblaming way. (For example, "To make sure your body is getting everything it needs, I'm going to ask you a couple of questions about what you are eating and drinking. Can you tell me everything you had to eat and drink yesterday?")
- Request a 3- or 5-day food/physical activity record that provides information on the types and quantities of food consumed, as well as the places and times food was eaten, the number of other people present, and the types of physical activities performed during the time period.

- Assess triceps skinfold and arm-muscle circumference to estimate body fat stores and muscle mass depletion.
- Rule out clinical nutritional deficiencies as causes of symptoms such as hair loss or dry skin.

Psychosocial Assessment

- Interview the child or adolescent and parents about circumstances surrounding the onset of changes in eating behaviors or weight.¹²
- Assess for depression, and rule out other psychiatric disorders (e.g., anxiety disorder, obsessive-compulsive disorder, bipolar disorder) as primary or comorbid conditions that might explain changes in eating behaviors and preoccupation with body weight and shape and size.¹²
- Assess risk of suicide.¹²

Counseling

In addition to providing health professionals with an opportunity to screen and assess children and adolescents for eating disorders, health supervision visits and sports preparticipation physical examinations provide an opportunity to promote healthy eating and physical activity behaviors and a positive body image.

Nutrition

- Emphasize the importance of adequate energy (calories) and protein in the diet.
- Reinforce the importance of consuming a variety of foods to provide adequate nutrition.

- Encourage adequate calcium intake for maintaining good bone health.
- Discourage meal skipping and other restrictive eating.
- Keep in mind that a discussion of pubertal changes may be a “safe” place to talk about body image with adolescents.
 - *Females.* Emphasize the fact that fat deposition (especially in the hips and thighs) is normal.
 - *Males.* Discuss the wide variability in the timing of normal growth and maturation and muscle development.
- Use BMI charts to discuss the wide range of body shapes and sizes within a range of healthy body weights.
- For overweight children and adolescents, carefully phrase recommendations for weight maintenance or loss, and help them identify behaviors they can improve.

Physical Activity

- Encourage regular physical activity with emphasis on activities the child or adolescent enjoys.
- Encourage parents to assess any physical activity program the child or adolescent is involved in to make sure it provides a healthy and safe environment. (See Tool D: Characteristics of Excellent Physical Activity Programs for Children and Adolescents.)
- Provide guidance on developmentally appropriate physical activities.

- Provide guidance on what is considered excessive physical activity and when parents should be concerned.
- Discuss the roles of calcium and physical activity in developing and maintaining healthy bones.
- Discuss physical symptoms that may be associated with excessive physical activity (e.g., dizziness, lightheadedness, amenorrhea, low heart rate, cold intolerance, stress fractures).



For Physical Education Teachers and Coaches

Health professionals may interact with a child's or adolescent's physical education teacher or coach. Many children as young as 4 or 5 years of age start taking direction from teachers and coaches, who can have a major influence on them.

Health professionals can encourage teachers and coaches to take the following positive actions:

- Encourage the child or adolescent to participate in developmentally appropriate physical activities.
- Provide feedback about the child's or adolescent's performance, emphasizing strength and mental focus and deemphasizing body fat and weight.
- Do not make negative comments about the child's or adolescent's physical appearance, weight, or eating behaviors. If a teacher or coach is concerned about a child's or adolescent's weight, the child or adolescent should be referred to a health professional.
- Discourage comparisons between children and adolescents and their performance and body size or weight.
- Learn the warning signs of eating disorders, and refer children and adolescents at risk to a health professional.
- Provide water, and encourage children and adolescents to drink sufficient fluids before, during, and after physical activity. If weight loss is a concern, weigh children and adolescents before and after practice and make sure that they drink enough water to regain their lost weight before the next practice.

Referral and Treatment

Comprehensive screening, assessment, and treatment of eating disorders in children and adolescents require an interdisciplinary team of health professionals who can provide nutrition counseling, medical care and monitoring, psychiatric evaluation, and individual and/or family therapy.

Hospitalization may be needed if the child or adolescent is severely malnourished, shows metabolic disturbances, or is at risk for suicide.¹³ If the child or adolescent has anorexia nervosa, it is essential to ensure a gradual and carefully planned return to healthy eating behaviors to prevent the “refeeding syndrome” associated with hypophosphatemia. Close monitoring of food intake and output, hydration status, physical activity, and weight is necessary for adjusting the dietary recommendations for steady weight gain.

Children and adolescents with eating disorders need long-term treatment and follow-up by a physician, mental health professional (including at least one evaluation by a psychiatrist), and dietitian. Because of the complexity of these disorders and the need to set clear, consistent behavioral limits, teamwork is essential.

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Suggested Reading

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FREQUENTLY ASKED QUESTIONS ABOUT PHYSICAL ACTIVITY AND EATING DISORDERS

■ **My daughter plays sports and occasionally goes on a diet. Should I be concerned?**

Restricting food intake can be harmful, especially during active periods of growth and vigorous physical activity. Dairy products are often the first food group to be restricted in a diet, and this may affect the development and maintenance of healthy bones. Also, dieting limits the overall amount of foods consumed, which may affect overall growth and development. Explain to your daughter that eating a variety of healthy foods can help her achieve optimal performance and endurance.

■ **A coach is asking my son to lose weight. Is this appropriate?**

No. Coaches should never recommend weight loss for children or adolescents. This decision should be made by the child or adolescent and their parents in consultation with a health professional. Weight loss in children and adolescents can be harmful, especially during periods of growth and development.

■ **Will my daughter develop an eating disorder if she participates in physical activity?**

No. Most physical activity protects male and female adolescents from eating disorders by improving their self-esteem and body image. You should be aware of any sudden change in your daughter's eating behaviors (for example, skipping meals, always requesting fat-free products, continually complaining about being fat, and participating in excessive physical activity).

■ **My son, who isn't very athletic, loves sports and is asking for a protein supplement to boost his performance. What should I do?**

There is little evidence that protein supplements improve children's or adolescents' physical activity performance. In fact, most are not regulated by the Food and Drug Administration, and some may be harmful. Explain to your son the potential risks of using supplements, and encourage him to eat healthy foods, including good sources of protein, to promote growth and development and optimal performance. Explain to your son that everyone grows at a different rate, and that differences in strength, endurance, ability, height, and weight reflect primarily genetics and the timing of growth. Encourage your son's interest in physical activity, and emphasize the importance of having fun, being healthy, and developing good sportsmanship. Applaud your son's efforts to pursue different activities, regardless of his skill level.

■ **My son's basketball coach says that a low resting heart rate is a sign of good physical condition. Is this true?**

Yes. A low resting heart rate is a sign of good physical condition, but a heart rate less than 60 beats a minute in a child or adolescent can be a concern, and the child or adolescent should be evaluated by a health professional. A common cause of a too-low heart rate is malnutrition associated with decreased caloric intake and/or excessive physical activity.

■ **Our family has a history of osteoporosis. Can physical activity improve my daughter's bone strength?**

Yes. Weight-bearing physical activities (for example, jumping rope, walking, running, and playing basketball) promotes the development and maintenance of healthy bones, but only if your daughter consumes enough calcium. Children ages 4 to 8 need to consume 800 mg of calcium per day, children and adolescents ages 9 to 18 need 1,300 mg per day, and adolescents ages 19 to 21 need 1,000 mg per day. If your daughter is lactose intolerant, a calcium supplement may be necessary. Calcium-fortified products (for example, orange juice) can also provide needed calcium. Female children and adolescents whose menstrual cycles have stopped or become irregular because of excessive physical activity and inadequate caloric intake are at risk for bone loss, even with adequate calcium intake.

Resources for Families

See Tool F: Physical Activity Resources for contact information on national organizations that can provide information on physical activity. State and local departments of public health and education and local libraries are additional sources of information.

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