



# Promoting the Participation of Children and Adolescents With Disabilities in Sports, Recreation, and Physical Activity

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The benefits of physical activity are likely universal for all children, including children and adolescents with disabilities (CWD). The participation of CWD in physical activity, including adaptive or therapeutic sports and recreation, promotes inclusion, minimizes deconditioning, optimizes physical functioning, improves mental health as well as academic achievement, and enhances overall well-being. Despite these benefits, CWD face barriers to participation and have lower levels of fitness, reduced rates of participation, and a higher prevalence of overweight and obesity compared with typically developing peers. Pediatricians and caregivers may overestimate the risks or overlook the benefits of physical activity in CWD, which further limits participation. Preparticipation evaluations often include assessment of health status, functional capacity, individual activity preferences, availability of appropriate programs, and safety precautions. Given the complexity, the preparticipation evaluation for CWD may not occur in the context of a single office visit but rather over a period of time with input from the child's multidisciplinary team (physicians, coaches, physical education teachers, school nurses, adaptive recreation specialists, physical and occupational therapists, and others). Some CWD may desire to participate in organized sports to experience the challenge of competition, and others may prefer recreational activities for enjoyment. To reach the goal of inclusion in appropriate physical activities for all children with disabilities, child, family, financial, and societal barriers to participation need to be identified and addressed. Health care providers can facilitate participation by encouraging physical activity among CWD and their families during visits. Health care providers can create "physical activity prescriptions" for CWD on the basis of the child's preferred activities, functional status, need for adaptation of the activity and the recreational opportunities available in the community. This clinical report discusses the

## abstract

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importance of participation in sports, recreation, and physical activity for CWD and offers practical suggestions to health care providers.

## GLOSSARY OF TERMS

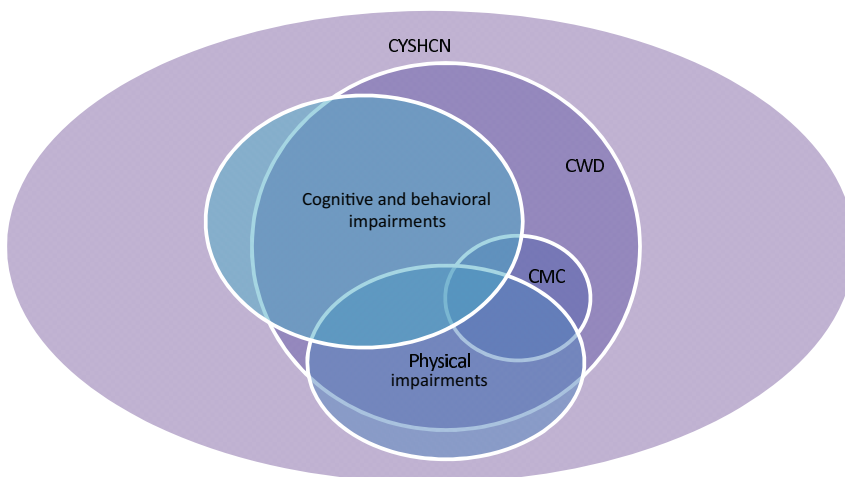
- Children and youth with special health care needs (CYSHCN) are “children who have or are at increased risk for a chronic physical, developmental, behavioral or emotional condition and who also require health and related services of a type or amount beyond that required by children generally.”<sup>1</sup> In the United States, 19% of children have a special health care need.<sup>2</sup> CYSHCN are a diverse group of children, ranging from children with chronic conditions, to those with medical complexity, to children with cognitive, behavioral, or emotional conditions. The term CYSHCN includes children with disabilities (CWD) and children with medical complexity, whom are described below and shown in Fig 1.
- CWD are defined under the Individuals with Disabilities Education Act (IDEA) as children with intellectual disabilities, hearing impairments (including deafness), speech or language impairments, visual impairments

(including blindness), serious emotional disturbance, orthopedic impairments, autism spectrum disorder, traumatic brain injury, other health impairments, or specific learning disabilities and who, by reason thereof, need special education and related services.<sup>3</sup> Although not part of the IDEA definition, the World Health Organization International Classification of Functioning, Disability and Health (ICF) framework provides an important alternative framework for disability because of its emphasis on body function, pursuit of meaningful activities, and community participation as primary determinates of the health of individuals rather than emphasis on any particular diagnosis or deficit (Fig 2).<sup>4</sup>

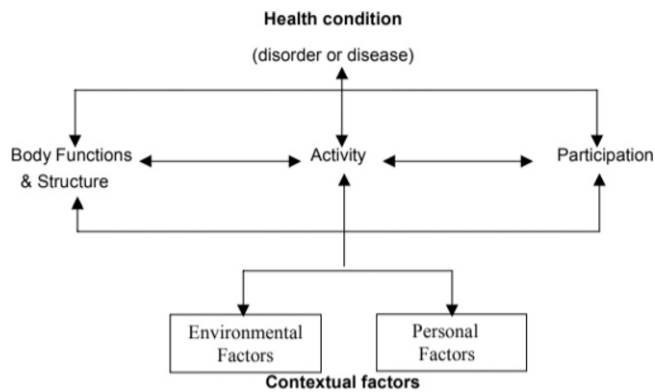
- Children with medical complexity have multiple significant chronic health problems resulting in functional limitations, high health care service needs, and often the need for or use of medical technology.<sup>5</sup> An example of a child with medical complexity is one with a genetic syndrome with an

associated congenital heart defect, difficulty swallowing, cerebral palsy, and a urologic condition. This child would typically require the care of a primary care physician; multiple pediatric medical subspecialists or pediatric surgical specialists, home nurses, and rehabilitative and habilitative therapists; community-based services; extensive pharmaceutical therapies; special attention to his or her nutritional needs and growth; and durable medical equipment to maintain health, maximize development, and promote function.

- Participation, defined by the ICF, is the nature and extent of a person’s involvement in desired activities, such as recreation, leisure activities, and community life. The ICF also emphasizes the interconnection of contextual factors, environmental and personal, that can have profound influences on participation. For example, finding out what recreational activities are enjoyable and fun for CWD (personal factors) and supporting families (environmental factors) can foster increased community participation and bolster overall health.<sup>6,7</sup>
- Physical activity refers to any body movement produced by skeletal muscles that requires energy expenditure.<sup>8</sup>
- Exercise is planned, structured, and repetitive physical activity that aims to improve or maintain one or more component of physical fitness.<sup>8</sup> Exercise may be subdivided into aerobic (cardiovascular endurance), flexibility (increase muscle and joint range of motion), anaerobic (resistance training), and high-impact weight-bearing exercise (that promotes bone health).<sup>8</sup>



**FIGURE 1** Diverse subgroups within CYSHCN. CMC, children with medical complexity.



**FIGURE 2** The World Health Organization International Classification of Functioning, Disability and Health. Reprinted with permission from World Health Organization. *Towards a Common Language for Functioning, Disability and Health*. Geneva, Switzerland: World Health Organization; 2002:9.

- PAVS, physical activity vital sign.
- AAI, atlantoaxial instability.

## INTRODUCTION

International efforts to promote the well-being of CWD through participation in exercise, sports, recreation, and physical activities began with the first competitive sporting event for individuals with disabilities in 1948, followed by the first Paralympics competition in 1960. Special Olympics was established in 1968 and is now the largest recreational program for children and adults with intellectual disabilities, with 5.5 million athletes in 1930 countries.<sup>9</sup> Despite the success of these programs, opportunities for CWD to participate in physical activity, exercise, or competitive sports remain limited, and they are less likely to participate compared with their peers without disabilities.<sup>10-12</sup> In the absence of such opportunities and the encouragement to participate, many CWD engage in more sedentary and solitary activities, leading to a higher prevalence of overweight and obesity, lower levels of cardiorespiratory fitness, and increasing social isolation.<sup>13-19</sup> Taking part in physical activity through recreation and sport

provides CWD the opportunity to achieve better physical and mental health, develop skills and competencies, express creativity, form friendships, and improve quality of life.<sup>20-23</sup> Thus, the American Academy of Pediatrics *Bright Futures: Guidelines for Health Supervision of Infants, Children, and Adolescents, Fourth Edition*, includes promotion of physical activity as a key health promotion theme and includes recommendations for health care providers to help CYSHCN and their families identify appropriate and enjoyable activities and implement adaptations based on need and ability.<sup>24</sup>

This clinical report discusses the importance of physical activity for CWD, reviews potential barriers to inclusion, and offers practical solutions for clinicians to facilitate participation. Of note, the terms CYSHCN, CWD, and children with medical complexity are overlapping (Fig 1). This clinical report focuses on the needs of CWD, but many of the comments and recommendations apply also to the larger group of CYSHCN. However, not all points or problems apply equally to the diverse subgroups of CWD. For example, some recommendations may apply more to children with physical impairments or children

with cognitive or behavioral impairments. Furthermore, the subgroups within CWD are also overlapping and can shift over time, such as the case in which a child with primary motor impairments as a young child might be more impacted by cognitive or behavioral impairments as an adolescent (Fig 1). Regardless of the subgroup, CYSHCN and all children with different abilities are at risk for being “left out,” which can adversely affect wellness, community integration, and full actualization of their individuality. Although it is hoped that children with and without disabilities engage in physical activity together, there will be times when CWD and their families opt for adaptive programs that are focused specifically on their needs. It must also be noted that there is a heterogeneity of adaptive recreation and sports programs, varying both by the type of primary impairment they are focused on and by the competitive levels of the programs. For example, Paralympians are high-performance competitive athletes who generally self-identify as primarily having physical or visual impairments, whereas Special Olympians are often individuals with intellectual and developmental disabilities who compete in many different sports at various competitive levels.<sup>9,25</sup> There are also sports programs for people with hearing impairments, with the most elite being the Deaflympics.<sup>26</sup> Although adaptive recreation programs have existed for more than 50 years, recently there has been accelerated growth in the number of programs, especially those with a primary purpose of fostering physical activity in a noncompetitive, fun environment. Whatever the activity or the level of competition, health care providers can engage in shared decision-making with CWD and their families with the goal of pursuing appropriate opportunities for physical activity.<sup>27</sup>

## **BENEFITS OF PARTICIPATION IN PHYSICAL ACTIVITIES**

The benefits of physical activity are likely universal for all children, including those with disabilities. CWD are underrepresented in exercise intervention research, resulting in a limited understanding of how research involving children without disabilities can be translated into guidance for physical activity programs for CWD. The limited research conducted to date points to at least short-term benefits for CWD, such as improvements in aerobic capacity, muscular strength, physical and cognitive function, body weight and composition, social skills, relationships, and psychological well-being.<sup>28–30</sup> Although many studies of exercise interventions for children with physical disabilities have small sample sizes and lack randomization, they support safe participation and improvements in fitness and well-being.<sup>31</sup> Several studies rated from moderate- to high-quality show that children and youth with physical disabilities who participate in physical activity programs improve their locomotor performance and skills, object control, social skills, peer interactions, and self-confidence.<sup>29</sup> One randomized trial of an 8-month weight-bearing physical activity program for children with cerebral palsy showed improvements in bone mineral density.<sup>32</sup> In some CWD, exercise interventions may even be able to slow disease progression. For example, in 2 randomized trials of assisted bicycle and upper extremity training, functional motor deterioration slowed in boys with Duchenne muscular dystrophy.<sup>33,34</sup> Ambulatory children with spina bifida can also increase their walking speed and cardiorespiratory fitness with treadmill training programs.<sup>35</sup> Thus, *Bright Futures: Guidelines for Health Supervision of Infants, Children, and Adolescents, Fourth Edition*, includes recommendations for health care providers to help CYSHCN and their

families identify appropriate and enjoyable physical activities and implement adaptations on the basis of their needs and abilities.

Physical activity also has benefits for children with primarily cognitive and behavioral disabilities. Children with autism spectrum disorder (hereafter referred to as autism), who are more likely to be diagnosed with overweight or obesity, have this risk attenuated with regular physical activity and sports participation.<sup>36</sup> Short periods of walking or running before educational sessions also help children with autism increase the proportion of correct academic responses and work tasks completed in school settings.<sup>37,38</sup> Other exercise interventions for children with autism, such as horseback riding, martial arts, swimming, yoga, or dance, can result in better social responsiveness and decreased irritability, stereotypical behavior, and hyperactivity.<sup>39–43</sup> Although stimulant medication is the mainstay in addressing core symptoms for children with attention-deficit/hyperactivity disorder, aerobic exercise offers a safe and widely beneficial adjunct in decreasing hyperactivity and improving attention and executive function.<sup>44</sup> Youth with intellectual disability who are overweight or obese benefit from participating in an integrative training program, with improved cardiorespiratory fitness, balance, muscle strength, and endurance as well as lower BMI.<sup>45</sup> Adolescents and adults with Down syndrome who receive individualized progressive resistance training over 10 weeks have increased muscular strength and become more physically active.<sup>46</sup>

Beyond the physiologic benefits, regular physical activity, recreation, and sports participation are associated with both psychosocial well-being and quality of life of CWD

as well as with improving academic achievements.<sup>21</sup> For example, participants in Special Olympics show heightened self-esteem, perceived physical competence, and peer acceptance when compared with nonparticipants.<sup>47</sup> Physically active individuals with cerebral palsy experience higher quality of life and happiness compared with those who are less active.<sup>20</sup> Children with autism who have higher levels of participation in organized activities, including sports, have better social-emotional adjustment as well as reduced loneliness and depression.<sup>48,49</sup> Children with muscular dystrophies who participate in physical activities, such as swimming, benefit by cultivation of friendships, increased self-confidence, and enjoyment.<sup>50</sup> Children with hearing impairment who participated in a 3-month ice skating program were found by their parents to have improvements in self-esteem, behavior, and sleep quality.<sup>51</sup>

Despite the physical, behavioral, cognitive, and psychosocial benefits of physical activity for CWD, the incorporation of physical activity is often prioritized below other interventions in treatment planning.<sup>49</sup> Yet, as the above examples illustrate, inclusion of physical activity into treatment plans allows CWD real-world and enjoyable opportunities to work on motor, communication, and social skill goals identified in traditional therapies, such as physical, speech, and occupational therapy.

## **BARRIERS TO PARTICIPATION**

Despite the potential benefits, CWD participate in sports, recreation, and physical activity less than children without disabilities, and they experience barriers to participation that go beyond the functional limitations associated with their disabilities (Table 1).<sup>52–57</sup> Without



**TABLE 1** Benefits, Barriers, and Considerations for Participation in Sports by CWD

Benefits of participation
Improved wellness
Increased community integration
Improved muscle strength
Improved fundamental movement skills
Enhanced psychosocial well-being
Increased cardiorespiratory fitness
Decreased morbidity (ie, pressure ulcers, infections, overweight and obesity, etc)
Improved bone health
Improved motor coordination
Improved attention and focus
Decreased maladaptive behaviors
Barriers to participation
False belief: no programs for this population
False belief: participation is unsafe or too risky
False belief: rules of sports too hard to learn or cannot be adapted to accommodate CWD
Low physical literacy
Lack of transportation to and from activities
Lack of needed supervision or expertise
Extra cost and time commitment
Facilitators to participation
Preparticipation evaluations to maximize safety with appropriate accommodations
Organized sports that are focused on fun over competition
Clinicians, physical education teachers, and coaches who create physical activity prescriptions and recognize individual needs
Adaptations such as longer rest periods, lower coach to athlete ratios, copious positive feedback, and close monitoring for symptoms of fatigue or injury

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addressing barriers to physical activity, CWD often fill leisure time with sedentary screen-based activities.<sup>18,58</sup> Frequently identified barriers to participation of CWD in sports and physical activity are the child's functional limitations, negative self-perceptions, high cost, lack of accessible facilities, lack of nearby facilities or programs, and lack of providers with adaptive recreation expertise.<sup>10,59–62</sup> In addition, many individuals with disabilities are still, to a large extent, socially segregated and experience negative societal stereotypes and low performance expectations, providing them with limited opportunities for participation in group-based physical activities.<sup>57,60,63</sup> Some CWD may be discouraged to participate by an implicit societal bias that favors competitiveness and winning over participation for the sake of fun, enjoyment, and inclusion. When CWD do attempt to participate in sports, they are also more likely to be bullied

by their peers<sup>64,65</sup>; this is especially true for CWD with obesity, who may experience additional weight-bias stigmatization. Primary care providers who have longitudinal and trusting relationships with CWD and their families can be positive role models and use nonjudgmental language and motivational interviewing to identify short-term goals and strategies related to eating and physical activity.<sup>66</sup> With negative experiences and lack of opportunities, support, or encouragement, some CWD may become disinterested or discouraged to participate. Older children and adolescents with disabilities may lose self-confidence to participate as skill gaps between them and their typically developing peers widen and sports become more competitive. Through required physical education services of a child's Individualized Education Program (IEP), schools can develop goals to address deficits in fundamental movement skills to foster physical literacy. However, most CWD

take general physical education classes, and although physical education teachers may make accommodations for some, budget constraints and lack of training are cited as barriers to participation.<sup>67,68</sup> Pediatricians, other professionals, and parents may also overestimate the risk of injury during physical activity, although involvement in sports has been shown to be reasonably safe for CWD; one recent study found a lower risk of injury in CWD after controlling for personal and environmental factors.<sup>60,69–71</sup> Nevertheless, parents of CWD are justified in desiring high-quality, accessible, and safe adaptive recreation programs, yet they report marked variation in recreational activity availability, long waiting lists for adaptive programs, absence of suitable transport to these facilities, a reduced number of skilled instructors to run these programs, and poor advertisement of programs in the community.<sup>60,61</sup> Likewise, pediatricians may be unaware of adaptive recreation opportunities within the community or of the family's interest in pursuing these opportunities.<sup>72</sup>

Overall, misconceptions and attitudinal barriers at the level of the individual, family, and community need to be addressed to integrate children of all abilities into recreational and physical activities. Pediatricians can help families and children balance the benefits of participation with the potential risks, recognizing that historically, being "too safe" and assuming that CWD "can't do that," has been a persistent barrier to participation.

#### **FACILITATORS TO PARTICIPATION**

The combined efforts of well-informed health care providers, parents, educators, coaches, and others are needed to ensure and promote the participation of all children in sports, recreation, and physical activity (Table 1). Health care providers can facilitate

participation by asking about current levels of activity and using tools, such as a physical activity vital sign (PAVS) in the electronic health record, to start the conversation about physical activity during visits.<sup>23</sup> The PAVS consists of 2 screening questions that are used to assess how many days per week the individual engages in physical activity that is moderate (causes the child or youth to sweat a little and breathe harder, such as bike riding or playground activities) to vigorous (causes the child or youth to sweat and be out of breath, such as running or swimming) and how many minutes this level of physical activity is maintained. Use of the PAVS has been associated with a greater likelihood of physician exercise counseling and improved metabolic outcomes in adults.<sup>73</sup> Clinicians can then create “physical activity prescriptions” for CWD with goals for participation and referrals to specific programs or resources that are based on baseline physical activity, preferred activities, functional limitations that may require adaptation of the activity and preparticipatory planning, and the evidence base of the physical activity regarding risks and benefits.<sup>23</sup> Providers can explore the child and family’s beliefs and attitudes about physical activity through motivational interviewing and arrive at a treatment plan through shared decision-making (Appendix 1).<sup>27,74</sup> Lastly, by their own commitment to physical activity, health care providers can serve as role models for CWD and their families. For example, pediatricians with self-reported higher levels of fitness are more likely to discuss physical activity during health supervision visits.<sup>75</sup>

To facilitate participation, providers can refer CWD to specialized adaptive programs staffed by recreational, physical, or

occupational therapists that create a safe and fun recreational environment while allowing coordination with the primary care provider if medical concerns occur.<sup>76</sup> Specifically, health care providers and care coordinators within practices can partner with local adaptive recreational programs that address traditional barriers to participation (time, cost, transportation) and share this information with families. For example, many city and county parks and recreation departments offer low-cost adaptive recreation opportunities for CWD, and some adaptive recreational programs offer scholarships and provide transportation to and from activities. Therapists and coaches at specialized adaptive recreation programs facilitate participation for CWD by having lower participant to coach or instructor ratios (fewer than 4 participants for each coach), using positive feedback, and individualizing activities to the preferences of each participant.<sup>77</sup>

Lastly, providers can work with local and state public health agencies to promote physical activity to create and strengthen recreational programs for CWD. The Title V Maternal and Child Health Services Block Grant Program has a National Performance Measure on physical activity, with only 25% of CYSHCN with more complex health needs meeting the measure of being physically active at least 60 minutes per day.<sup>78</sup> At the federal level, the Centers for Disease Control and Prevention funds and supports 2 national centers on disability: Special Olympics and the National Center on Health, Physical Activity and Disability. These centers identify and expand physical activity programs, provide training for professionals, and provide data to establish best practices.<sup>79</sup>

Parents, caregivers, and peers are important facilitators of physical activity for CWD. Parents who believe in the benefits of physical activity report higher levels of activity in their CWD.<sup>70</sup> In one study, CWD whose parents were physically active at least 3 hours per week were 4.2 times as likely to be physically active compared with those whose parents were less active.<sup>80</sup> Therefore, an important message from pediatric health care providers to parents of CWD is to prioritize their own physical activity and to include CWD in family recreational activities.<sup>81</sup> Additionally, CWD are too often left behind regarding organized sports participation despite the clear benefit of participation for CWD. Parents can advocate for and support organized sports that encourage inclusion and focus on fun instead of winning, such as Special Olympics, because these are important influencers of sustained participation by CWD.<sup>65</sup> In addition, peer-mediated interventions to facilitate play skills and foster inclusion and acceptance of CWD by modeling behaviors can be an effective counterbalance to the barrier of systematic exclusion that has (in the past) resulted in opportunities for bullying behaviors.<sup>82,83</sup>

The American Heart Association has called for schools to play a central role in ensuring all students participate in enough physical activity to develop healthy lifestyles.<sup>84</sup> With only 24% of CWD engaging in 60 minutes of physical activity daily, schools can help a greater proportion reach this level of activity.<sup>85</sup> The Centers for Disease Control and Prevention recommends that a substantial percentage of students’ overall physical activity should be obtained through school physical education. The right of CWD to participate in physical activity and sports in school is rooted in several federal laws. The

IDEA mandates free, appropriate public education in the least restrictive environment, and Section 504 of the Rehabilitation Act of 1973 requires that no individual shall be excluded because of disability in programs that receive federal funds.<sup>86</sup> Physical education is a federally mandated component of special education services, including the promotion of physical fitness, fundamental movement skills, and skills in individual and group games and sports.<sup>67</sup> However, many school districts allow exemption from physical education requirements for students with cognitive and other disabilities.<sup>87</sup> Physical education curricula for CWD can promote enjoyment of movement and skill development that can be incorporated before, during, and after school hours.<sup>88</sup> Pediatric providers and parents can partner with the educational team to include physical activity goals in progress metrics within a child's IEP to facilitate participation in physical activity at school.<sup>86</sup> Physical activity can be accurately measured for CWD through subjective and objective measures.<sup>89</sup> Adaptive physical education teachers can address physical activity goals by modifying recreational programs to accommodate the motor skills, muscle strength, and fitness of each child. Strategies physical education teachers use to accommodate CWD may include simplified instruction, additional skill modeling, peer teaching, equipment modification, and coordinating activities with a special education teacher.<sup>68</sup> Beyond physical education, the Comprehensive School Physical Activity Program developed by the Centers for Disease Control and Prevention and the Society of Health and Physical Educators, is a framework to capture all opportunities for school-based physical activity for CWD.<sup>90</sup> School nurses can coordinate with pediatricians in developing and implementing health care plans that promote safe participation in physical

activity.<sup>91</sup> School-based physical activity programs, such as recess or physical education, that are focused on fun and enjoyment are strongly associated with daily physical activity in CWD.<sup>88</sup>

### PREPARTICIPATION CONSIDERATIONS

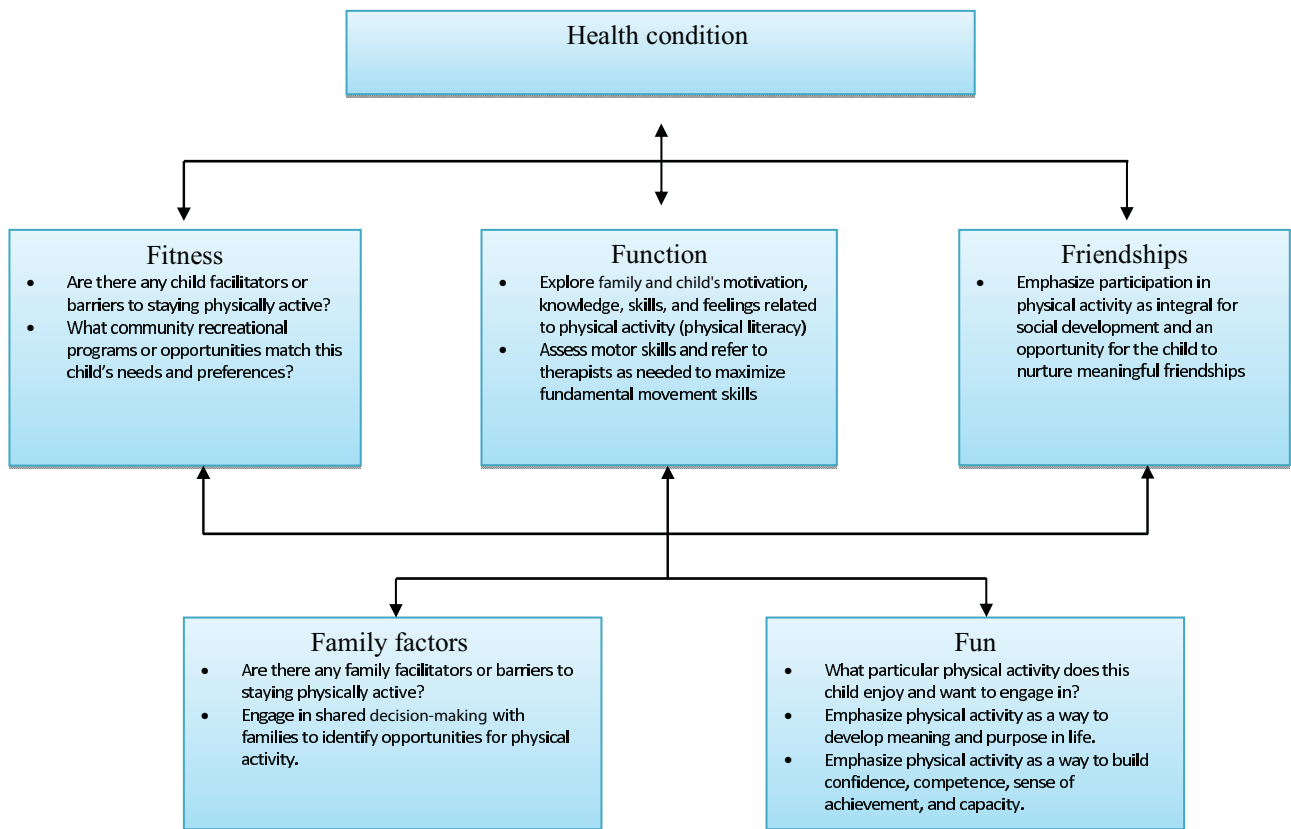
It is important that all CWD participate in activity-related recreational programs while minimizing risks of illness or injury. Well-designed programs can target fundamental movement skills (throwing, catching, kicking, jumping, running, hopping, balance), flexibility, cardiorespiratory endurance, and muscular strength while maximizing enjoyment and safety. Rather than being excluded from sports participation, all children can be empowered to take part with a can-do attitude, enjoying the dignity of taking acceptable risk during participation just as individuals without disabilities are allowed to do. It is also important to involve parents and caregivers early and often in discussions of the importance of participation in sports, recreation, and physical activity for CWD.

A first step toward regular physical activity of all children, including CWD, is achieving physical literacy, which is the "the ability, confidence, and desire to be physically active for life."<sup>92</sup> For children with typical development, fundamental movement skills emerge in early childhood after the attainment of gross and fine motor milestones in infancy. Later in childhood, provided the child has opportunities to engage regularly in active play and physical activity throughout the day, additional competences are gained in coordination, balance, running, kicking, throwing, and catching.<sup>23</sup> The attainment of these fundamental movement skills influences physical literacy, is a strong predictor of future physical activity levels of children, and is

linked to improvement in cardiovascular fitness scores and BMI.<sup>93</sup> Thus, CWD who have decreased gross motor function or other developmental delays may lack fundamental movement skills, may have low physical literacy, and are subsequently at risk for developing a low preference for physical activity during childhood and later in life.<sup>23,94</sup> Physical literacy assessments by health care providers are essential to allow early identification of any deficits.<sup>95</sup> Physical literacy assessments for all children begin in early childhood and encompass surveillance and screening for motor delay and exploring the child and family's knowledge, motivation, and feelings related to physical activity and movement.<sup>23,96,97</sup> Figure 3 provides an adaptation of the ICF framework for pediatricians to use in assessing physical literacy and promoting physical activity in CWD.<sup>7</sup> For CWD who have motor delays, referrals to exercise-related specialists (physical therapist, physical medicine and rehabilitation physician, recreation therapist, sports medicine physician) for structured programming may help to maximize the child's potential in developing fundamental movement skills, which in turn may foster confidence and desire to participate in sports and recreation.<sup>98,99</sup> Furthermore, young CWD can be given the same opportunities as other children to participate in free play and recess to develop fundamental movement skills and to foster the notion that physical activity is fun.<sup>100,101</sup> One such program to include students with autism with typically developing peers during recess activities led to improvements in peer engagement.<sup>102</sup>

### How Much Physical Activity to Recommend?

All children, including CWD, are encouraged to strive to follow



**FIGURE 3** Adaptation of the International Classification of Function as a framework of assessing physical literacy and promoting participation of CWD in sports, recreation, and physical activity.<sup>7</sup> Adapted from World Health Organization. *Towards a Common Language for Functioning, Disability and Health*. Geneva, Switzerland: World Health Organization; 2002:9.

guidelines established by the 2018 Physical Activity Guidelines Advisory Committee, which recommends that children and adolescents (6–17 years) take part in at least 60 minutes of moderate to vigorous physical activity daily as well as in bone and muscle strengthening activities at least 3 days a week.<sup>103</sup> Parents of infants are encouraged to keep them active several times a day through interactive floor-based play, and parents of preschool-aged children (3–5 years) are encouraged to have their children accumulate at least 3 hours of light- to moderate-intensity activity throughout the day to develop movement skills.<sup>23,104–106</sup> For CWD, some modifications may be required to the frequency, intensity, and/or duration of physical activity. Goals need to be realistic, with an emphasis on

encouraging children and families to do whatever they can through a gradual exploration of increases in time, intensity, and duration.<sup>104</sup> By asking CWD and their families about usual weekly duration and intensity of physical activity, health care providers can adapt physical activity guidelines to accommodate for neuromuscular deficits and cardiorespiratory profiles associated with specific conditions.

#### **The Preparticipation Evaluation: Special Concerns for CWD**

Families of CWD will sometimes schedule mandatory preparticipation physical evaluations or recommended health supervision visits. In either case, these visits allow opportunities for families and providers to discuss medical and psychosocial issues that are relevant for participation in physical activity.

The concepts of self-determination and shared decision-making have emerged as important themes in the care of CWD.<sup>27</sup> Discussions with children and families may start with a query about the child's current level of physical activity and the importance the family and child place on being physically active. Families of CWD may experience high levels of day-to-day stress and may consider time for physical activity a lower priority. Using behavioral techniques, such as motivational interviewing, providers can explore the family's beliefs and develop achievable physical activity goals. Once the wishes of the child and family are known, conditions that may interfere with participation or predispose the child to injury can be collaboratively discussed between the child, family, provider, and other treatment team members.



The child's current health status and functional ability, demands of the sport (including level of competition), and whether the sport can be modified with protective or adaptive equipment to allow for safer participation are important considerations. Given the complexity, the preparticipation evaluation for CWD may not occur in the context of a single office visit but rather over a period of time with the assistance of care coordination from the primary care medical home to obtain input from the child's multidisciplinary team, which may include subspecialists such as physical medicine and rehabilitation or sports medicine physicians; school nurses, coaches, and physical education teachers; and recreation, physical, and occupational therapists. Ideally, members of the multidisciplinary team can periodically reassess CWD to update treatment plans, including recommendations about sport participation, adaptations, and any restrictions deemed necessary.

The goal of the preparticipation evaluation is to review the desired activities of the child and family and the current state of disability-specific and co-occurring conditions to provide an appropriate menu of activities and potential accommodations or precautions that may be needed. Tables 2 and 3 show elements of a preparticipation history and physical examination that can be used for CWD. For example, children with physical disabilities, such as cerebral palsy, may have decreased flexibility with joint contractures, muscle strength imbalances, and lack of motor control, coordination, and equilibrium, which may increase the risk of lower extremity overuse injuries, strains, and sprains. If a child with cerebral palsy wishes to play baseball and there are limitations in skills (catching, throwing, and using a bat), it may be advisable to consider ways to adapt

the sport or the child's participation to prevent injury to the athlete or other participants.<sup>107</sup> Children with neurologic conditions who use wheelchairs for ambulation are at higher risk of upper extremity overuse injuries, peripheral nerve entrapment (eg, carpal tunnel syndrome), and pressure sores affecting the sacrum and ischial tuberosities.<sup>108</sup> The preparticipation evaluation presents an opportunity to screen for skin ulcerations and, when present, initiate appropriate treatment before sports participation.<sup>109,110</sup> Inspecting the adaptive or medical equipment used by CWD participating in sport so that braces are appropriately fitted and sports wheelchairs are in proper working order promotes optimum performance and injury prevention. Families can be encouraged to bring all equipment used during physical activity to the preparticipation visit so that these assessments can be conducted. If needed, referrals to exercise-related subspecialists (physical therapist, physical medicine and rehabilitation physician, recreation therapist, sports medicine physician) can be made for equipment adjustments or other equipment concerns.

The preparticipation evaluation also allows for the provision of anticipatory guidance that promotes safe participation for children with physical disabilities. For example, athletes with spinal cord pathology above the sixth thoracic level may develop autonomic dysreflexia, which is excessive and uncontrolled sympathetic nervous system output. This condition, which can be life-threatening, may be triggered by bladder infections, sunburns, and other stimuli or may be self-induced by an act such as occluding a bladder catheter in an attempt to improve sport performance (also known as "boosting"). Autonomic dysreflexia may present with symptoms and signs such as

headache, high blood pressure, or bradycardia, and these symptoms prompt immediate removal of the precipitating factor and prompt medical care.<sup>107</sup> Children with spinal cord injuries and cerebral palsy are also at risk for abnormal thermoregulation and exertional heat illness resulting from impaired sweating and control of peripheral blood flow as well the use of certain medications (such as those with anticholinergic properties).<sup>107,111</sup> As is the current practice for most adaptive and therapeutic sports organizations, coaches can modify the activity as needed, provide frequent breaks of appropriate duration, have ready access to fluids, and use appropriate clothing and equipment, which can mitigate this risk.<sup>107,111,112</sup>

Children with developmental disabilities also benefit from preparticipation planning and anticipatory guidance. For example, children with autism may have apraxia and motor coordination deficits, increasing the risk for injuries.<sup>113</sup> This risk can be managed by adaptations to the activity or the equipment or with additional neuromotor training to develop kinesthetic awareness.<sup>114</sup> Children with intellectual disability may have lower muscle strength, balance, flexibility, and endurance and may benefit from exercise that is of lower intensity as well as preparatory conditioning, such as resistance training, to reduce the risk of injury.<sup>108</sup> Children with Down syndrome are at slight increased risk of symptomatic atlantoaxial instability (AAI). Neurologic manifestations of AAI with cervical cord myelopathy include significant neck pain, radicular pain, weakness, spasticity or change in tone, gait difficulties, hyperreflexia, and change in bowel or bladder function or other signs or symptoms of myelopathy. In the

**TABLE 2** Elements of a History During Preparticipation Evaluation for CWD

History	Comments
Is there a history of seizures?	Children with uncontrolled seizures or implantable devices (eg, ventriculoperitoneal shunt, vagal nerve stimulator) may benefit from consultation with a neurologist or neurosurgeon, respectively, to assist with medical eligibility. Although there is no universal exclusion for participation in contact sports for children with epilepsy, some families may choose to avoid sports in which seizure activity would pose risk to self or others (eg, archery, riflery, weightlifting, and sports that involve heights). There are considerations related to prevention of drowning in children with epilepsy who swim. <sup>118</sup> In addition, some antiepilepsy drugs can impair normal sweating.
Is there a history or concern for hearing or vision loss?	Boxing and full-contact martial arts are not recommended for functionally one-eyed athletes. <sup>119</sup> Visually asymptomatic CWD are encouraged to have a vision screening based on the <i>Bright Futures</i> periodicity table. Those with ocular signs or symptoms are recommended to have a complete examination by a pediatric ophthalmologist. <sup>120</sup>
Is there a history or concern for cardiopulmonary disease?	Children with stage 2 hypertension are recommended to refrain from high-static sports (weightlifting, gymnastics). Children with congenital heart disease, structural heart disease, and dysrhythmias are encouraged to have consultation with a cardiologist. <sup>119</sup>
Is there history of symptomatic AAI?	Children with symptomatic AAI may report or demonstrate fatigue, gait abnormalities, neck pain, limited neck range of motion, changes in coordination, spasticity, hyperreflexia, clonus, or extensor-plantar reflex. Parents can be advised that participation in contact sports, such as football, soccer, and gymnastics, places children at risk for spinal cord injury. <sup>115</sup>
Is there a history of heat stroke or heat exhaustion?	Thermoregulation in children with spinal cord injuries can be impaired because of skeletal muscle paralysis (impaired shivering and reduced ability to produce heat) and a loss of autonomic nervous system control (impaired sweating and vasodilation to dissipate heat). Athletes who have a history of heat illness are more at risk to develop the condition again.
Is there a history of fractures or dislocations?	Ligamentous laxity and joint hypermobility are more common in some disabilities, such as Down syndrome and Ehlers-Danlos syndrome. Children with obesity, those with osteogenesis imperfecta, and athletes in wheelchairs may have reduced bone mineral density with increased fracture risk.
Are there adaptive devices used during sports participation?	Health care providers are encouraged to be aware of the child's need for adaptive equipment. Athletes using wheelchairs are at increased risk for shoulder and wrist injuries and upper extremity peripheral nerve entrapment syndrome.
Is there a need for bladder catheterization?	Athletes with spinal cord injuries or other neurologic conditions may have neurogenic bladder and need an indwelling catheter or require intermittent catheterization.
Is there a history of pressure sores or ulcers?	Children who use wheelchairs are prone to pressure ulcers over the sacrum and ischial tuberosities.
What medications is the child taking?	Medications used for pain and bladder dysfunction can interfere with the normal sweating response; medications that alter QT intervals also may require special assessments.
Is there a history of autonomic dysreflexia?	Autonomic dysreflexia is acute onset of excessive, unregulated sympathetic output that can occur in children with spinal cord injuries at or above the sixth thoracic spinal cord level. This condition may occur spontaneously or may be self-induced (boosting) in an attempt to improve performance. <sup>121</sup>

Adapted from American Academy of Pediatrics. Athletes with a disability. In: Bernhardt DT, Roberts WO, eds. *PPE: Preparticipation Physical Evaluation*. 5th ed. Itasca, IL: American Academy of Pediatrics; 2019:182–183.

absence of myelopathic signs and symptoms during the preparticipation evaluation, routine radiographic evaluation of the cervical spine is not recommended.

Children and youth with Down syndrome can be encouraged to participate in activities they enjoy, although contact sports, such as football, soccer, and gymnastics,

may place them at increased risk of spinal cord injury.<sup>115</sup>

As the above examples illustrate, for each child and youth with a

**TABLE 3** Elements of a Physical Examination During Preparticipation Evaluation for CWD

Physical Examination Components	Items to Screen
Ocular	Decreased visual acuity Ocular health Strabismus Abnormalities in ocular appearance
Cardiovascular	Cardiovascular heart disease Hypertension
Neurologic	Peripheral neuropathies Inadequate motor control Inadequate coordination and balance Clonus Impaired hand-eye coordination Sensory dysfunction AAI Hyperreflexia Ataxia Muscle weakness Spasticity Upper motor neuron and posterior column signs and symptoms
Dermatologic	Abrasions Lacerations Blisters Pressure ulcers Rashes
Musculoskeletal	Limited neck range of motion AAI Torticollis Decreased flexibility, often with contractures; decreased strength, and muscle strength imbalance Wrist and elbow extensor tendinitis in athletes using wheelchairs Rotator cuff tendinitis and impingement in athletes using wheelchairs Pelvic dysfunction caused by lower extremity prosthetic device causing unequal leg lengths

Reproduced with permission from: American Academy of Pediatrics. Athletes with a disability. In: Bernhardt DT, Roberts WO, eds. *PPE: Preparticipation Physical Evaluation*. 5th ed. Itasca, IL: American Academy of Pediatrics; 2019:185

disability, pediatricians can review condition-specific information, current medications, and other individualized aspects of the history to offer recommendations that promote safe participation. Concerns or questions that arise during the preparticipation visit can be addressed through consultation with a sports medicine or physical medicine and rehabilitation physician, who can provide additional guidance. Although a comprehensive review of preparticipation considerations is beyond the scope of this report, health care providers are encouraged to refer to the publication *PPE: Preparticipation Physical Evaluation, Fifth Edition*, which has a chapter

titled “Athletes with Disability.” A supplemental history form for athletes with a disability and a Special Olympics medical form are available for download at <https://www.aap.org/en-us/advocacy-and-policy/aap-health-initiatives/Pages/PPE.aspx> or in Supplemental Fig 4.<sup>116</sup>

### RECOMMENDATIONS

Pediatricians can promote participation of children and adolescents with disabilities in sports, recreation, and physical activity in the following ways:

1. Assess motor development, physical literacy, and physical activity levels at all health supervision visits with CWD.

- a. Adding a PAVS to visits can help start conversations about physical activity with CWD and their families.

Communicate the physical, behavioral, cognitive, and social-emotional benefits of participation in sports, recreation, and physical activity to CWD and their caregivers (Table 1).

- a. Promotion of physical activity is a *Bright Futures* key health promotion theme to be aware of in each stage of child development.<sup>24</sup>

Health care providers can make a difference when they agree to “take the pledge” to talk to their patients about physical activity (<https://www.nchpad.org/pledge/doctalk>). Encourage parents to be physically active and encourage inclusion of CWD in family recreational activities. Recognize, identify, and address barriers to participation at the individual, family, community, and societal levels to increase the opportunities for CWD to be physically active (Table 1).

- a. Refer CWD to local adaptive and therapeutic recreation programs that decrease the barriers to participation. If there is limited access to local programs, home-based programs with adapted exercises and movements can be recommended. Free-to-access videos are available through the National Center on Health, Physical Activity and Disability (<https://www.nchpad.org/Videos>).

Pediatricians can partner with families, schools, and community organizations in advocating for safe, affordable, accessible, and inclusive recreational programs for CWD to reduce disparities in participation in physical activity; Encourage participation by discussing physical activity goals with CWD and their families and

partnering with interdisciplinary team members to develop physical activity prescriptions that can be incorporated within an after-visit summary within the electronic medical record. If a handwritten paper note is preferred, a free physical activity prescription pad is available through the Americans with Disabilities Fund at <http://foundationforpmr.org/old/physicians/diagnostic-population/rx-for-exercise-pediatrics-new/>.

- a. Participation in recreation, sports, and physical activity has inherent risk for all. Rather than exclusion from sports participation, pediatricians can encourage CWD to adopt a can-do attitude, enjoying the dignity of taking acceptable risk during participation just as individuals without disabilities are allowed to do.

While striving to meet the 2018 Physical Activity Guidelines Advisory Committee recommendations for physical activity, some CWD will require modifications to the frequency, intensity, and/or duration of physical activity. Realistic goals can be based on gradual increases in baseline duration and intensity of physical activity.

Perform preparticipation evaluations for CWD, in collaboration with the child, family, pediatric specialists, and therapists, leading to opportunities to participate in sports and recreational activities with appropriate adaptation to minimize risk of injury (Tables 2 and 3).

- a. Encourage families to bring adaptive equipment used during physical activity to visits to assess need for adjustments or referrals.

*PPE: Preparticipation Physical Evaluation, Fifth Edition*, serves as a resource for medical providers to

keep athletes safe and healthy while participating in sports and includes condition-specific preparticipation considerations for athletes with disabilities.

The use of a preparticipation form can promote the documentation of relevant medical issues that can be shared with therapeutic recreation programs, schools, and coaches (Supplemental Fig 4; <https://www.aap.org/en-us/advocacy-and-policy/aap-health-initiatives/Pages/PPE.aspx>). Partner with children, parents, and educational teams to include physical activity goals and modifications in a student's IEP and advocate for school-based physical activity programs for CWD.

Be aware of and actively refer to local school and community-based organizations that offer appropriate physical activity programs and sports for CWD.

- a. Local and state disability organizations, such as family-to-family health information centers and Family Voices, may have up-to-date lists of adaptive recreation programs (<https://familyvoices.org/>).

Web sites of national organizations, such as Special Olympics, the National Center on Health, Physical Activity and Disability, and Move United, can provide information on local activities (see Resources for Health Care Providers and Families).

Advocate at the local, state, and national levels for policies that promote inclusion of CWD in sports, recreation, and physical activity and for surveillance systems that include CWD to track participation and access.<sup>117</sup>

## SUMMARY AND CONCLUSIONS

Participation in free play, sports, recreational programs, and physical activity improves health, well-being, and quality of life for CWD and their families. Although more research is needed to confirm specific outcomes

and benefits, particularly among individuals with higher levels of disability, clinicians should not hesitate to promote physical activity for CWD. Well-informed decisions regarding each child's participation are made through consideration of individual activity preferences, overall health status, motor skills, balance, muscle strength, bone strength, fitness level, and the availability of adaptive programs. Child, family, and societal barriers to participation continue to exist and need to be directly identified and addressed through advocacy at the local, state, and federal levels. Pediatric health care providers are urged to promote healthy, active living for CWD through physical activity, exercise, recreation, and organized sport by creating specific physical activity prescriptions suited to the child's interests and ability. The benefits are substantial not only for the children who participate but also for communities that welcome them.

## RESOURCES FOR HEALTH CARE PROVIDERS AND FAMILIES

- National centers on health promotion for people with disabilities: National Center on Health, Physical Activity and Disability (<http://www.nchpad.org>) and Special Olympics (<https://www.specialolympics.org>);
- Paralympics (<https://www.paralympic.org>);
- US Association of Blind Athletes (<http://www.usaba.org>);
- Miracle League (<http://www.themiracleleague.net>);
- Move United (<https://www.moveunited.org>);
- Achilles International (<http://www.achillesinternational.org>);
- National Wheelchair Basketball Association ([nwba.org](http://www.nwba.org));
- Easter Seals (<http://www.easterseals.com/our-programs/camping-recreation/recreation-and-sports.html>);



- *PPE: Preparticipation Physical Evaluation, Fifth Edition* (<https://www.aap.org/en-us/advocacy-and-policy/aap-health-initiatives/Pages/PPE.aspx>);
- America the Beautiful access pass for federal recreation sites (<https://www.nps.gov/planyourvisit/passes.htm>); and
- Medical Home Portal, Recreational Activities page (<https://www.medicalhomeportal.org/living-with-child/other-needs/recreation-activities>).

## APPENDIX: SAMPLE PROCESSES IN CREATING PHYSICAL ACTIVITY PRESCRIPTIONS FOR CWD

### Example 1

During a health supervision visit for a 10-year-old girl with autism spectrum disorder, the clinician notes her BMI is greater than the 95th percentile. On the PAVS, the mother reports 1 day of physical activity per week for 20 minutes. When asked, the child indicates she likes playing basketball, but her mother reports that previous attempts at several team sports, including basketball, have been negative experiences. Her mother explains that the skills required, the pace of play, and the increasingly competitive aspect of the team exceeded her capability, resulting in her becoming discouraged and quitting. She has since become more involved in sedentary activities, such as video games and television viewing. Through a previous collaboration with the state parent-to-parent network, the care coordinator for the practice maintains a list of local adaptive recreational programs. The clinician informs the family of a low-cost adaptive basketball program for CWD offered by the nearby parks and recreation department. Through motivational interviewing, the child and parent agree to walk the family dog to the park 3 times per week, where she can practice basketball in addition to the twice weekly basketball activities offered through the adaptive recreation program. Her after-visit summary includes a physical activity prescription with the contact information for the program and the goals of basketball 3 times per week and walking to the park 3 times per week. At follow-up in 3 months, the child proudly shows the clinician the team

photograph of her adaptive basketball team. Her PAVS has improved to 4 days of activity per week for 40 minutes. Her mother reports meeting families of other CWD through the program, which has resulted in friendships and the child wanting to enroll in other sports offered.

### Example 2

A 12-year-old boy with hemiplegic cerebral palsy, intellectual disability, and attention-deficit/hyperactivity disorder is seen in follow-up. Despite taking stimulant medication, he continues to display impulsive and oppositional behaviors, especially at home. He is tripping and falling and complaining of more pain, leading to less physical activity. He previously had an ankle foot orthosis but stopped wearing it after excessive skin irritation and pain. His PAVS filled out by his mother shows 2 days of activity per week for 30 minutes. His examination shows increased right upper and lower extremity tone and hyperreflexia. His right hamstrings and gastrocnemius muscles are tight, and his right ankle does not dorsiflex past 0°. Through motivational interviewing, he expresses a desire to participate in martial arts, which his mother states he initially enjoyed before quitting because of pain. His after-visit summary includes a physical activity prescription for martial arts after consultation for further preparticipation planning with several specialists. He is referred for a physical medicine and rehabilitation consultation with the request for assistance in preparticipation planning for martial arts. In the physical medicine and rehabilitation clinic, his spasticity is treated with intramuscular botulinum toxin injections, and he is fitted with a new ankle foot orthosis. He is referred to physical therapy and has weekly sessions to address goals of improving core strength, balance, and lower extremity flexibility and to refine and reinforce his home exercise program. He visits with his primary care pediatrician regularly, often bringing the latest color belt that he has earned in karate. His mother feels that the stimulant medication, his home exercise program, and martial arts have helped with attention, focus, and quality of life.

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#### ABBREVIATIONS

AAI: atlantoaxial instability  
CWD: children with disabilities  
CYSHCN: children and youth  
with special health care  
needs  
ICF: International Classification  
of Functioning, Disability  
and Health  
IEP: Individualized Education  
Program  
PAVS: physical activity vital sign

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