Considerations for Exercise and Sport Participation in Children with Disabilities

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Abstract

The importance of exercise and physical activity has been well documented. Despite a relatively large number of children and adolescents living with disability, physical activity and sports activity participation is lower in children with disabilities. Risk for obesity is higher in children with disability. There are a variety of factors that affect participation in physical activity and/or sports. Some of these factors include physical, social, and environmental barriers; lack of access to resources; and parental views and support. Participation levels also vary depending on the type of disease process. In order to get children with disabilities more involved in physical activity, there are a few studies demonstrating the benefits of exercise or community exercise and strengthening programs. Similarly, there are a variety of sports and physical activity programs that children can get involved with. As a healthcare practitioner, it is essential to be aware of medical factors, injury risk, and available resources to assist with an individualized program for the child with a disability so the child can improve his/her overall physical and social well-being. This review manuscript aims to provide an overview of some of the issues affecting physical activity participation in children with disability and some of the special considerations in getting children involved.

Keywords: Children; Disability; Physical activity; Sports

Introduction

Although the benefits of exercise and sports participation has been well documented for the general population, for children and youth with disabilities, there are various considerations that may affect their overall participation in such activities. In the United States, it is estimated there are approximately 49.7 million persons with a long lasting disability or chronic condition according to US Census 2000 data [1]. There are about 5.5 million children and adolescents living with a disability and about 12% of this population are school age children [2]. Despite the number of children with disabilities, children with disabilities may be less likely to participate in physical activity due to physical, psychologic and emotional barriers. It is important to encourage physical activity and sports in children with disabilities, however there are special considerations in relation to various disease processes. This article will review some of the potential barriers to physical activity; types of physical activity that can be considered; and medical considerations in certain disease populations for children with disabilities.

Factors Affecting Participation in Physical Activity and/or Sports

It has been found that children and youth with disabilities have lower levels of physical activity and fitness compared to non-disabled peers. Children and adolescents with disabilities are also at higher risk of being physically inactive or participating in more sedentary activities. Additionally, it has been shown that children and youth with disabilities are also not as commonly members of sports teams. Only 29% of children with disabilities classify themselves as being physically active. Unfortunately this puts more children and adolescents at higher risk for obesity [3]. According to the Youth Risk and Behavior Survey, the rates of being overweight are much higher in adolescents with physical disabilities than age matched controls when using the definition of obesity as BMI>95th percentile [2].

Some of the lower levels of participation may be related to perceived barriers to physical activity in children with disabilities. It is felt that there are multiple factors that affect participation which include functional abilities, skills, interests and family culture. General barriers include lack of sidewalks or damaged sidewalks; inaccessible routes; lack of fitness facilities or recreational areas that have appropriate equipment; lack of knowledge by staff at exercise or community facilities that are knowledgeable about persons with disabilities; lack of access to community resources for available programs; and lack of access to adaptive equipment for sports or physical activity [2].

There are also factors of the physical, social, and institutional environments. In one study by Law, parents of children with disabilities found that school and work environmental barriers seemed to have the biggest impact on participation. No peer support system, teasing, and budgetary cutbacks in various school districts may contribute to this perceived barrier. Physical and structural barriers around the school were also a factor in participation. As children get older and become more independent, perceived barriers seem to increase. Additionally, less functional children tend to experience larger perceived barriers [4].

Participation in physical activity can also vary depending on the disease process of the child. In school aged cerebral palsy children, it is found that although the children participate in a wide variety of activities, these activities were often home based and not as diverse. There was less of a tendency for children to become involved in community activities. More involved children, with higher GMFCS scores were less physically active. Physical activity and skilled-based activities in comparison to other leisure activities were also less [5]. Shikako-Thomas et al. [6] did a systematic review on children with disabilities and found similar findings in the cerebral palsy subjects. In
this review paper, parents cited restricted mobility as being the largest barrier to participation in leisure and or physical activity. The article also stated girls tend to do more art and social activities while boys did more group activities with sports and physical activity [6].

In children with neurodevelopmental disorders, they had higher rates of participation in supervised physical activity at school compared to other children with chronic medical conditions. Patients with mild disabilities demonstrated higher physical activity and school outing participation than children with more severe disabilities. However, compared to non-disabled children, these levels of participation were still less than optimal [7]. In children with Developmental Coordination Disorder, it was found that they participated in fewer activities and less intense physical activities than non-disabled controls. As in children with neurodevelopmental disorders, the children who had more severe motor and coordination difficulties had less physical activity participation [8].

In Duchenne’s Muscular Dystrophy, although the Duchenne patients chose diverse activities for participation and were involved in the activity as frequently as healthy controls; the activities chosen were less physical in nature. Overall, the Duchenne Muscular Dystrophy patients demonstrated significantly lower physical activity participation. It was also found that younger patients with Duchenne’s Muscular Dystrophy were more likely to participate in physical activity than older Duchenne’s patients [9]. In children with Intellectual Disability, prior studies showed similar findings of overall less physical activity compared to healthy norms. A more recent study by King showed that in Intellectual Disability children, although they enjoyed out of school activities to the same extent as healthy norms; they preferred more recreational activity (could include television, video games) and self-improvement activities over skill based activity which would include sports [10].

Parental and social factors will also influence a child with a disability to participate in physical activity. Some parents may feel protective and prefer that that their children not be exposed to the possibility of failure or injury. Other parents may want their child to excel and therefore not invite participation. In one study by Martin 2009, he found parents of children with disabilities did encourage physical activity and appreciated that children seemed to like participating in physical activities. However, parents were found to not consider their children as highly skillful [11]. Financially, parents who received financial assistance to have help in the home for the care of the child were less likely to participate in physical activities. This however could reflect a more medically involved child [5]. Shikako-Thomas article mentions that families of children with disabilities recognize that leisure activities reduced stress, however time constraints, financial burden, and lack of support decreased participation [6].

Participation in physical activity is important as lower level of physical activity in children tends to carry over into adulthood. However, in a survey of adults with disabilities about barriers, the adults with disabilities perceived similar barriers as shown in the pediatric population [12]. Additionally, less active children will also lead to obesity and all of the secondary co-morbidities associated with obesity that will carry over into adulthood.

Physical Activity Programs

Despite the barriers, exercise has been shown to be beneficial in children with disabilities. Certain exercise programs have been investigated for their overall effectiveness in children with disabilities. In Cerebral Palsy, a more recent study was done by Auld. They examined 8-15 years old GMFCS I and II patients. They examined a community based strength-training program that involved once a week sessions for 8 weeks. Activities included upper and lower body strengthening, core work, and balance and coordination activities. They found strength improvements in elbow flexors, hip abductors, ankle dorsiflexors and ankle plantar flexors. The increased strength of hip abductors and ankle dorsiflexors the authors felt were significant possibilities for carry over to improved gait. Balance gains were variable [13]. Prior studies for children with cerebral palsy participating in a community strength training or exercise program demonstrated various degrees of improvements in strength and sometimes function. Cardiovascular studies overall have been done less frequently in children with disabilities [13].

Aquatic therapy and/or exercise is commonly used for persons with disabilities. Fragala-Pinkham examined aquatic exercise in twenty ambulatory children 6-12 years old with disabilities. The program was for twice a week for fourteen weeks. It was found that that aerobic exercise was helpful for improving times on the half-mile walk. The authors felt this was a reflection of improved cardiorespiratory endurance. Patients also had increased exercise capacity as they could exercise longer periods at their target heart rate. The findings were similar to prior studies [14].

For muscle disease patients, the level of intensity of exercise and type of exercise has to be carefully considered. In a Cochrane Review article in 2012, it was found that moderate intensity exercise in myotonic dystrophy, or FSHD does not show evidence of harm to muscles. Aerobic exercise training in dermatomyositis and polymyositis also seems to not cause damage to muscles. It was found that strength training was not harmful in FSHD, myotonic dystrophy, mitochondrial disorders and dermatomyositis or polymyositis. It is safe for the combination of strength training and aerobic exercise in myotonic dystrophy type I. In the articles reviewed, although the above findings did not harm muscle, there is insufficient evidence to show the benefit from exercise [15].

Wheelchair dependent patients are especially at risk for obesity. Patients with lower extremity disabilities have obesity rates 2.5x higher than non-disabled patients. Patients who are paralyzed and wheelchair dependent have less overall energy expenditure which contributes to higher obesity rates. Finding ways to help these patients become physically active can be challenging. One study involved the BENefit program (behavioral approach to exercise and nutrition education to improve fitness). This program involved children with spinal cord dysraphisms who participated in nine biweekly sessions over sixteen weeks. They received education on nutrition and were provided with aerobic and strengthening exercises. Although there was no change in body weight or body mass index, they did find an increase in lean tissue and work capacity. They also found increased shoulder strength although there was no improvement in elbow strength [16].

Most studies performed to date on special populations and disability are small studies and not optimally designed studies. There are not a lot of studies on cardiovascular effects on exercise in children with disabilities. There is more room for research in this area.
Sports Participation Considerations for Specific Diseases in Children with Disability

Benefits of exercise and sport participation in children with disabilities include social integration, peer acceptance, cognitive development, achievement, social integration, and feelings of normalcy [17]. As a healthcare practitioner, it is essential to understand the importance of physical activity and sports participation in children with disabilities. However, it is also important to be aware of what factors need to be considered from the medical standpoint for children who want to become more physically active or join a community sports program.

A standard Pre-participation Physical Examination (PPE) for students can be used to assess ability to participate in sports. In children with disabilities there are no specific guidelines for PPE and the form is not tailored for children with disabilities. A multidisciplinary approach to pre-participation assessments is recommended. The examiners should be cognizant of possible co-morbidities related to the athlete’s diagnosis. It is also generally recommended that children with disabilities should have their PPE assessments done in clinic and not in the group setting as in non-disabled children participating in school sports physicals. Cardiopulmonary assessment for sports participation has not been well studied in pediatric patients with disabilities. One may consider an arm crank or bicycle maximal stress test if there are concerns for cardiopulmonary health. Overall the pre-participation evaluation should help guide the patient to the right sport, ensure fair competition, and ensure they are not inappropriately excluded from a certain activity [17].

Ramirez looked at high school athletes with disabilities injury rates and found that there were 38 injuries out of 512 athletes in interscholastic adapted sports leagues. This study included children with various disabilities. The highest injuries occurred in children with autism, who had 5x the injury rate of athletes with mental disabilities. The second highest group was children with seizures who had 2.5x the rate of those without seizures. Soccer was the sport with the highest rate of injury. Although injuries were found in a variety of sports, more than 50% of the injuries were abrasions and contusions. Most of these injuries occurred to the legs (44%), followed by arm (26%), then head/face/neck (21%). The mechanism of injury usually involved running or walking when a student-athlete would collide with another athlete or object [18]. Similarly, in a study of Summer Paralympic athletes, the most common injuries were abrasions, soft tissue contusions, strains and sprains Fractures were uncommon. Other studies have demonstrated similar findings of minor injuries for persons with disabilities participating in various sports [19].

Traumatic spinal cord injury patients involve various medical considerations. The family and patient should be aware of the signs and symptoms of autonomic dysreflexia which may occur during physical activity. Headache, elevated blood pressure, abnormal sweating, flushing and heart rate changes may occur. Removing possible triggers such as tight clothing, bowel, bladder relief, checking for skin or pressure sores, making sure equipment is not causing abnormal pressure on the body may need to be done. Medications at times may be necessary. Non-disabled children may be sensitive to extremes of heat or cold and may be at higher risk of hypo- or hyperthermia. Children with traumatic spinal cord injuries may have difficulties with temperature regulation and should be very closely monitored for signs of hyper- or hypothermia. Following any child for signs of dehydration and allowing frequent rest breaks is imperative. If water activities are involved, signs of hypothermia should also be monitored. Impaired sensation, neurogenic bowel and bladder may interfere with activity participation and ensuring the child has adequate equipment, appropriate supplies and has appropriate times for breaks for catheterizations is necessary. Depending on the frequency of competition, overuse injuries of wrists, hands, shoulders also need to be followed [20]. Education on wheelchair gloves, clothing, skin, weight shifts, appropriate wheelchair fit should be provided to the patient.

Myelodysplasia or spina bifida patients and some spinal cord injury patients can also be at risk for other types of injuries. Overall they may have hand-eye coordination problems, decreased aerobic power, decreased endurance, obesity, pressure ulcers, and ligamentous laxity. Due to immobility, they are at increased risk for osteopenia and fractures of the lower extremity. Fractures can occur in up to 30% of patients, especially if they are nonambulatory. Muscle strains can also be seen as a result of poor conditioning. If the patients are ambulatory with crutches, they may develop pain in the shoulder or hands. Brace use and skin checks have to be carefully monitored. These patients should not participate in high impact contact sports to minimize risk for spinal cord injury. There are options such as sled hockey which can be done. Additionally, if a ventriculoperitoneal shunt is in place, sports is not necessarily contraindicated. However, high contact sports should be avoided along with activities such as scuba diving. A helmet and/or other protective gear is also recommended if there is a shunt in place. There are multiple sports that myelodysplasia patients can participate in and their participation should be individualized. Incorporation of adaptive equipment may be necessary and providing community resources may be essential in helping the child participate [17,19].

Children with Cerebral Palsy have various levels of impairment and function. Children may have spasticity or other musculoskeletal deformities and/or muscle imbalance that may make them more prone to injury. Patellofemoral pain or injury can be common. Skin irritation or callous formation from braces can also be seen. It is essential for a good stretching program before physical activity or sports activity to minimize risk for injuries. Overuse injuries, sprains, strains can be common from muscle imbalance and spasticity. Cardiovascular fitness is usually lower and overall strength is usually lower. However, exercise is beneficial. Strength training should be encouraged. Bracing support can facilitate participation especially if the child is weightbearing and/or ambulatory. They may enjoy activities such as dance, ice-skating, wheelchair basketball, track and field, swimming, skiing, horseback riding and weight training. Adaptive equipment may again be necessary [17,20].

Amputee and limb deficiency patients benefit from physical activity and exercise. It helps with development of motor coordination, integration with peer groups and adjustment to physical limitations. Strength gains are also possible. In children, it is essential the prosthetic appropriately fits to minimize skin breakdown, pressure sores, blisters, or rashes. Terminal overgrowth is common in children, especially over the fibula, tibia, humerus, radius, ulna and femur. Prostheses may need to be frequently adjusted to minimize problems with terminal overgrowth [20]. For lower limb prosthesis users it is also essential to monitor for signs of dehydration or heat exhaustion as their energy expenditure is going to be higher than children without limb deficiencies. Frequent rest breaks should be encouraged. Muscle imbalance can occur in this population as well and children may...
biomechanically compensate with the intact limb leading to pain or overuse problems on the non-prosthetic side [20]. They can also compensate for weak muscles with back extension leading to pain complaints of the back [19]. This patient population can participate in a variety of competitions. The prosthesis can be utilized in most sports activities.

Down syndrome patients may be at increased risk for sprains, strains, and joint instability due to ligamentous laxity. They may have recurrent patella subluxation, patella alta, and flexible pes planus. They also are at risk for atlanto-axial instability. Sports activities should include aerobic and strengthening activities. Overall strength is usually lower so sports participation is beneficial. Contact sports that involve head collision such as tackle football and hockey should be avoided [20].

Previously, routine x-rays were recommended annually in Down Syndrome but this topic has recently become more controversial as there was question if radiographs truly predict risk for cervical injury in these patients. The American Academy of Pediatrics now states that regular radiographic screening is not supported by current evidence in asymptomatic children. Parents should be educated that participation in some sports such as football, soccer and gymnastics may put the child at some increased risk for cervical injury. Trampoline use under six years old should be avoided in children with and without Down Syndrome and older Down Syndrome children should use trampoline with supervision only. Down’s syndrome patients with signs and symptoms of cervical injury or myelopathy should have neutral cervical spine x-rays. If these are normal, then flexion extension x-rays should be done. They should be referred to appropriate specialists if abnormal x-rays [21].

Despite the AAP’s recommendations for Down Syndrome and atlanto-axial instability, if a child is participating in Special Olympics, the Special Olympics policy requires full extension and flexion x-rays for gymnastics, diving, pentathlon, butterfly stroke in swimming, diving start in swimming, high jump, soccer, alpine skiing, equestrian, squat lift, judo, snowboarding and any activities that put undue stress on head and neck muscles. Without documentation from a physician that has been briefed on the condition that there is no atlanto-axial instability, the child or athlete is restricted from these activities. If they are found to have atlanto-axial instability on x-ray, they are permanently restricted from participation [22].

For more severely involved patients, there is not as much research on the benefits of physical activity and sports. However, there are a few options that may be considered. Some communities have power wheelchair soccer where patients who are quadriplegic may still participate in a team sport if cognitively enough aware to participate. Water exercises can be an option in a variety of disabilities, even if severe. Boccia ball can be used by a variety of athletes and can be used in severe or high quadriplegic athletes as well. Some organizations offer adaptive bowling. There are options for adaptive water skiing as well [23].

In children with muscle disease, various factors may decrease overall participation. Due to atrophy of disuse from a sedentary lifestyle, they have reduced functional mass and functional impairments. Additionally, due to their muscle disease process, they have muscle degeneration which further leads to decreased activity levels. They have lower energy expenditure and tend to exercise at lower intensity levels than controls. Motivation to participate may be affected by muscle weakness and fatigue and these factors may negatively affect quality of life [24]. Concentric exercise activities are preferred over eccentric due to evidence of muscle damage with eccentric exercises. Endurance type of exercises are thought to be safe in Becker’s. Power wheelchair activities and/or water therapy can be considered in this population.

The Center for Disease Control recommends developmentally, age appropriate moderate to vigorous activity 60 minutes a day for non-disabled children ages 6-18. This has been shown to decrease body fat, reduce weight, and improve aerobic fitness [25]. There are no standard FITT principle (frequency, intensity, type, time) recommendations for children with disabilities. Children with disabilities may require lower intensity and less frequent participation. Recommendations for FITT principles will have to be individualized based on diagnosis and clinical findings.

The decision to allow a child with a disability to participate in sports or physical activity should be individualized. The practitioner has to consider developmental milestones and overall readiness to participate in sports and/or physical activity [23]. Functional deficits also need to be considered in discussing what types of sports a child can become involved with. Parents and patients should be educated on potential risks of injury and potential medical complications. Ideally, the healthcare practitioner should also be able to provide the patient and family with resources for equipment, community programs, and school programs. However information and access to these resources may vary depending on the community served.

Conclusion

There are multiple benefits to physical activity in non-disabled and disabled children. In children with disabilities, physical activity and sport participation overall are decreased compared to non-disabled children. The reason for this is multifactorial. There are various physical, social and environmental barriers that may contribute to this finding. There are a few studies documenting exercise interventions and benefits for patients, however more research needs to be done. Community and scholastic resources vary greatly. However, when a child with a disability or family wants to pursue physical activity or sports, they should be encouraged to do so. Participation should be individualized and the child and patient should be fully informed of potential injuries, medical considerations and receive information on community resources in order to accomplish their goal.

References


