



# 9

## Key Concepts in Understanding Motor Disabilities

*Mary Jane Rapport*

*University of Colorado, Anschutz Medical Campus*

*Amy Barr*

*Cherry Creek School District*

*Maria Jones*

*University of Oklahoma Health Sciences Center*

### **9.01 Impact on Education and Participation**

#### **Learning Outcome**

*Understand the impact of motor disabilities on participation of students in school and on learning.*

### **9.02 Team Support for Students**

#### **Learning Outcome**

*Comprehend the role of the IEP team and related service providers in supporting students with motor abilities and their participation in school.*

### **9.03 Meeting Students' Needs**

#### **Learning Outcome**

*Describe strategies for meeting the physical assistance and management needs of students with motor disabilities in daily routines and school-related activities.*

### **Introducing ... Sophie**

#### **Age: 7-Year-Old First Grade Student**

#### **Diagnosis: Genetic Syndrome with Visual Impairment**

*Sophie is a seven-year-old first grade student who lives with her parents, Janelle and Sarah. Sophie is Janelle's biological daughter. Both parents are involved with Sophie's care and education, and they maintain frequent communication with her teachers. Sophie was observed to have atypical development soon after birth when she had difficulty feeding and significant low muscle tone. Her parents have been told she likely has a genetic syndrome, and they have elected not to pursue any detailed genetic testing at this time. She began receiving physical therapy, occupational therapy, and speech therapy through an early intervention program at age two months. At three years of age, Sophie began receiving these services through her school district as an eligible child with disabilities under IDEA Part B. Her motor skills have improved slowly. Sophie holds her head against gravity for several minutes when given physical*

support at her trunk and shoulders, and she rolls on the floor with help once or twice using a poorly coordinated pattern.

Sophie attends her neighborhood elementary school and participates in the general education classroom during the morning routine, circle time, specials classes, lunch, and recess. In the first grade classroom, Sophie has support from a paraprofessional who assists her with mobility, communication, and modified academic tasks. Sophie receives special education instruction for language arts and math in a classroom with three other special education students. She wears glasses and visually attends best when toys and materials have high contrast or are lighted. She inconsistently communicates her needs and preferences by smiling and, more frequently, by crying when she is unhappy. Sophie uses a manual wheelchair for mobility at school and is dependent on others to lift her out of her chair or to change her position. Sophie's decreased muscle strength and endurance limit her ability to control her head and body during functional tasks. Sophie wears ankle-foot orthoses due to decreased muscle tone and joint stability in her foot and ankle. She spends 30 minutes out of her wheelchair during the school day, either on a floor mat or in a supine stander. When on the mat, Sophie moves her arms and legs against gravity but her movements are poorly coordinated, and she fatigues quickly. Sophie has a gastric feeding tube (G-tube) in place for nutrition and does not take food by mouth. She relies upon teachers and other school staff for hygiene and self-care tasks such as diapering and handwashing.

Sophie's team has identified these primary goals for her: helping her improve her communication with peers and adults, and increase her participation in group activities in the classroom, such as completing the sign-in routine and placing completed work in the teacher's basket. Identified steps to achieve these goals include developing a predictable and consistent yes/no response with Sophie, improving her head and trunk control while seated, and improving consistency of hand grasp and release skills.

### Introducing ... Teo

#### **Age: 16-Year-Old High School Student**

#### **Diagnosis: Cerebral Palsy, Seizure Disorder**

#### **GMFCS Level: III**

Teo is a 16-year-old high school student who lives with his parents, grandmother, and 2 siblings. Spanish is the primary language spoken at home. During meetings between Teo's family and school staff, an interpreter is present to translate between English and Spanish. In order to facilitate more frequent communication between the family and school staff, a Spanish-speaking staff member records and translates messages on a switch-activated device that Teo brings to school each day. Teo was diagnosed with cerebral palsy and a seizure disorder at five months of age and rated at a Level III on the Gross Motor Function Classification System (GMFCS). (Level III is similar to moderate impairment and will be described more fully in this chapter.) He received comprehensive early intervention services and had surgery to increase the stability of his hip joints when he was four years old. Teo has received physical, occupational, and speech therapy at school since preschool. As Teo's motor skills developed and became commensurate with his GMFCS level III rating, physical and occupational therapy services prioritized consultation services focused on practice and generalization of acquired skills, development of accommodations and modifications to school activities and routines, and staff training.

Teo is enrolled in his local high school and attends general education classes with a modified curriculum and support from a paraprofessional who works with two other students. He also participates in special education instruction including functional academic courses in math and language arts and a life skills class. As part of his transition plan, Teo has begun a job-shadowing program in order to explore his interests and preferences. Teo initiates communication primarily with familiar adults, and this is accomplished using gestures or his high-tech voice output communication device. He requires adult facilitation to initiate communication with peers and to use more than one- or two-word responses. Teo walks between adjoining classrooms and within his home using a four-wheeled rear walker with forearm supports. At school, he leaves each class several minutes early in order to walk between classrooms in a less crowded hallway. He uses a manual wheelchair when moving between hallways or buildings in his school and when in the community. Teo has difficulty sidestepping or walking backwards

*due to decreased balance, muscle stiffness, and weakness in his legs. Therefore, Teo requires physical assistance from adults for transfers in and out of a chair or seated position and when moving from one stable surface to another. He has a gastric feeding tube (G-tube) for supplemental nutrition but has been increasing his oral food intake. Teo enjoys eating lunch with peers in the cafeteria and is beginning to use an adapted spoon to feed himself pureed foods. Teo uses a modified toilet seat with armrests and requires physical assistance for transfers on and off the toilet and for personal hygiene.*

*Teo's team would like to increase his independence with completing assignments and tasks in general education and facilitate improved social interactions with peers in preparation for a successful transition to adult life. Identified steps to achieve this goal include improving self-advocacy skills, expanding his communication skills using a technology device, and providing additional supports to facilitate his independence at school and in the community.*

## IMPACT ON EDUCATION AND PARTICIPATION

Students with physical disabilities and motor impairments attend schools and participate actively in the educational setting despite challenges in accessing all the areas of the school or managing the necessary tools and equipment that may be essential to support or enhance learning. Quality education programs for individuals with motor disabilities include instruction as part of an academic and/or life skills curriculum and physical management routines. In addition, these students are most likely to benefit from therapy services, provided as related services under IDEA, designed around developing specific skill and abilities, and addressing specific impairments, to assist the students to benefit from their education through active participation. The intended result of any education program involves the ability to *participate and produce functional outcomes* in communication, mobility, socialization, work, and learning. For example, teaching a student to stand and move with assistance from a wheelchair to a toilet, a desk in the classroom, or onto the floor requires an instructional program or plan. Students with motor disabilities also require conscientious management of their physical needs in all settings—home, school, work, and community environments—and without this focus on their physical impairments, the ability to perform activities and to fully participate may be limited.

Caregivers and school teams must manage lifting, carrying, positioning, feeding, toileting, dressing, and other similar routines when a student with motor disabilities is unable to perform the routine independently, or is unable to fully complete the necessary steps in all settings. Physical management routines allow adults (or peers) to use procedures, equipment, or alternative strategies to (1) *remediate*, or (2) *compensate* for the absence or loss of function. Remediation is useful for building upon existing skills or intervening to improve upon an existing impairment. Compensation suggests that alterations in the routine can be made to allow for greater participation. A third strategy for physical management involves modification of the environment or personal factors (directly related to the individual) in an effort to (3) *prevent* further impairment or harm.

Lifting a student to move him/her from one location, or surface, to another, or positioning the student in an adaptive chair can be done in ways that promote relaxation or in ways that make a student stiff, uncomfortable, or fearful. Proper positioning can provide the support and comfort necessary for a student to engage in active learning and communication during the school day. Occupational therapists and physical therapists, together with family members, teachers, and other adults, can ensure that they use the most effective and most efficient ways to manage a student's physical needs in all settings. Addressing students' needs will depend on their age and size, the degree and type of motor disability, the setting, and the person who will be carrying out or performing the routine. In addition to the resources available from the student's IEP team and related service providers in school, many useful internet resources, including such websites as the American Academy for Cerebral Palsy and

Developmental Medicine ([www.aacpdm.org](http://www.aacpdm.org)), United Cerebral Palsy ([www.ucp.org](http://www.ucp.org)), along with a variety of useful videos ([www.youtube.com](http://www.youtube.com)) are available.

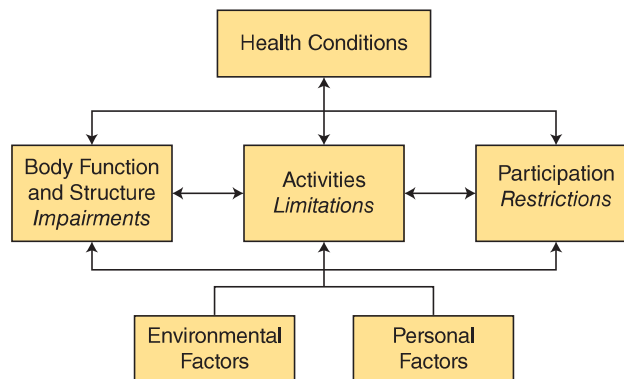
This chapter provides an overview of students with motor disabilities, beginning with the need to understand how physical impairments can impact access to educational settings, services, and supports, while focusing on how participation can be influenced by implementation of an IEP that offers the student opportunities for remediation, compensation, and prevention. Furthermore, related service providers can address quality of movement and offer other members of the IEP team strategies to accommodate the physical needs of these students so that they will participate as fully as possible in school and other activities and daily routines in everyday settings. Throughout the chapter, you will become acquainted with two students: Sophie, a seven-year-old first grader, and Teo, a 16-year-old high school student. Both of these students are introduced to you in the chapter-opening vignettes. These students share characteristics with many other students you may encounter in schools and they will illustrate the variety of ways in which IEP teams address students' physical needs in school. We know that students with motor disabilities will need to receive some *support or services* to address their *access* to education and *daily routines* that occur during school.

### International Classification on Function (ICF)

The International Classification of Function (ICF) is a framework used across many disciplines to describe an individual's functional status related to a health condition. The framework focuses on what a person is able to do, rather than what a person is unable to do. The approach defines three perspectives: body structure and function, the person as an individual, and the relationship between personal and environmental factors that contribute to the health condition. Introduced by the World Health Organization in 2001, the ICF framework describes changes to health as the dynamic interaction between the health condition and contextual factors (see Figure 9–1). Important to note is that this was the first time that “health” was considered as a primary element in a model describing disability and was considered to be a radical philosophical change when compared to earlier models used to understand the impact of disability on participation and function within daily routines.

The ICF approach allows for health conditions to be used as the construct or framework upon which to describe or define the diseases, disorders, injuries, or traumas affecting the individual, while the *body function and structure* identify which physiological functions or anatomic parts of the body are most impacted by the health

**FIGURE 9–1**  
ICF Framework



(Reproduced, with permission of the publisher, from *International Classification of Functioning, Disability and Health: ICF*, page 9, World Health Organization, 2001.)



**FIGURE 9–2**  
CF Terminology

## Definitions of ICF Domains of Functioning and Associated Disability

ICF Domains of “Functioning”		ICF Descriptions of “Disability”		Application of ICF terms to Sophie
<b>Body Functions</b>	Physiological and psychological functions of body systems	<b>Impairments</b>	Problems in body function or structure (such as significant deviation or loss)	Sophie has decreased muscle strength and limited endurance for performing movement or holding her head and trunk erect against gravity.
<b>Body Structures</b>	Anatomical parts of the body (including organs, limbs, and their components)			
<b>Activity</b>	The execution of a task or action by an individual	<b>Limitations</b>	Difficulties an individual may have in executing activities	Sophie holds her head against gravity for several minutes when given physical support at her trunk and shoulders.
<b>Participation</b>	Involvement in a life situation	<b>Restriction</b>	Problems an individual may experience in involvement in life situations	Sophie has support from a paraprofessional who assists her with mobility, communication, and modified academic tasks in the classroom.

(Adapted from Leimkuehler and the American Academy of Orthotists & Prosthetists Online Learning Center. Retrieved from [http://www.oandp.org/olc/lessons/html/SSC\\_09/module2.asp?frmCourseSectionId=7CC1D52A-9E9D-4A03-A2F0-78AE7DB64977](http://www.oandp.org/olc/lessons/html/SSC_09/module2.asp?frmCourseSectionId=7CC1D52A-9E9D-4A03-A2F0-78AE7DB64977))

condition. The impairments are the specific deviations or problems as a result of body structure and function. *Activity limitations* are recognized as difficulties that result when impairments interfere with the ability of the individual to perform a task or action. Ultimately, *participation* is the connection to function, and participation restrictions are the problems an individual may experience as his or her activity limitations restrict involvement in life situations. (Additional clarification of these terms using examples linked to Sophie can be found in Figure 9–2.) Key *environmental factors* include the physical, social, and attitudinal environments in which people live and conduct their lives; *personal factors* are the many other aspects of life that create variability in living. These include the psychosocial factors, executive function, socioeconomic status, healthcare access, and the like.

Related service providers can use the ICF framework when working with students with motor disabilities in schools to better understand the students' ability to participate in their school day. The ICF framework allows us to organize the consideration of physical management routines for students with motor disabilities. An example of this application for our student Teo is provided later in this chapter (see example in the section Meeting Students' Needs). Although physical therapists and occupational therapists address a student's impairments through specific therapeutic interventions that focus on compensation and remediation, the goal of such interventions is to allow the student to become better able to perform simple functional actions toward achieving the larger goal of performing an activity. For example, buttoning a shirt is one functional action related to the larger goal of dressing. Partial participation, as described in Chapter 1, is a step toward achieving independence, whereby adjustments in personal and environmental factors may allow a student with severe disabilities the opportunity to engage in a level of participation in the classroom that was previously not possible. For example, Teo partially participates in eating lunch while continuing to receive nutritional support via the G-tube and the use of an adapted spoon and pureed foods during self-feeding.

The ICF framework may be a beneficial one for the IEP team to use in organizing the student's priorities for participation while noting the activity limitations and impairments in body structure and function that IEP goals could address. In addition, identification of appropriate special education and related services necessary to achieve the goals should become apparent as the team recognizes how they can respond to the student's limitations in body structure, environmental, and personal factors. The ability to measure participation, and to distinguish this from activity—as elements of participation—have been recognized as barriers to fully understanding the extent to which a child, or student, is able to engage in common routines in typical settings (Coster & Khetani, 2008).

### Gross Motor Function Classification System (GMFCS)

Students with significant physical, intellectual, sensory, and behavioral impairments have long been referred to as having severe disabilities. Recognizing that this term is often used to describe the presence of one or more conditions that are substantially limiting, or the absence of functional skills necessary for participation in daily routines and activities, the diverse and heterogeneous nature of characteristics associated with *severe disabilities* suggests that other classification systems may be useful for members of the school team. The Gross Motor Function Classification System (GMFCS) was introduced in 1997 by *CanChild* ([www.canchild.ca](http://www.canchild.ca)) as a measure of the performance in home, school, and community settings (Palisano, Rosenbaum, Bartlett, & Livingston, 2008; Palisano, Rosenbaum, Walter, Russell, Wood, & Galuppi, 1997; Rosenbaum et al., 2002; Rosenbaum, Palisano, Bartlett, Galuppi, & Russell, 2008).

The GMFCS is based on the student's usual, or most common, ability and not on his or her peak or optimal performance, thereby capturing what is described as a *current level of function*. Using an ordinal scale for a five-level classification system, the gross motor function of children and youth with cerebral palsy is described according to the ability of the child to perform functional activities while reflecting the impact of personal and environmental factors. Judgments on quality of movement should not impede a measure of how the child functions using self-initiated movements associated with sitting, walking, and wheeled mobility. Age bands (incremental differentiation by specific ages) measure performance of the child before age 2, between 2 to 4 years, 4 to 6 years, 6 to 12 years, and 12 to 18 years; these age bands distinguish between functional abilities that change over time and may be dependent on the child's varying needs for assistive technology that include mobility devices (walkers, crutches or canes, or wheeled mobility) with limited influence on the quality of movement. When the GMFCS level is appropriately determined, the child's performance can be understood as a measure of their function. Children do not generally change GMFCS levels as they develop (Palisano, Cameron, Rosenbaum, Walter, & Russell, 2006). Therefore, the GMFCS can also be used as a prognostic tool to determine the ability a child will likely have as he or she ages (McCormick, Brien, Plourde, Wood, Rosenbaum, & McLean, 2007). Figure 9–3 describes GMFCS Levels I–V for the age band of children 6 to 12 years of age. Descriptions of functional abilities, or performance at each level, are slightly different for each age band.

*Teo is at GMFCS Level III using the 12–18 year old band. At this level, he is able to walk using a four-wheeled rear walker with forearm supports to assist with mobility. He uses a manual wheelchair for longer distances in school and when in the community. He can climb stairs slowly by holding onto a railing or with moderate assistance. Although Teo may work on some skills that are described in Level II, it is unlikely his performance will change to the extent he would move to a different level. He may learn to walk short distances using forearm crutches or may need slightly less assistance when ascending or descending stairs, but according to the prognostic abilities of the GMFCS, he won't move from Level III to Level II.*

**FIGURE 9–3**  
GMFCS Levels I–V for 6–12 Year Olds

**Level I**

Children walk at home, school, outdoors, and in the community. Children are able to walk up and down curbs without physical assistance and stairs without the use of a railing. Children perform gross motor skills such as running and jumping but speed, balance, and coordination are limited. Children may participate in physical activities and sports depending on personal choices and environmental factors.

**Level II**

Children walk in most settings. Children may experience difficulty walking long distances and balancing on uneven terrain, inclines, in crowded areas, confined spaces, or when carrying objects. Children walk up and down stairs holding onto a railing or with physical assistance if there is no railing. Outdoors and in the community, children may walk with physical assistance, a handheld mobility device, or use wheeled mobility when traveling long distances. Children have at best only minimal ability to perform gross motor skills such as running and jumping. Limitations in performance of gross motor skills may necessitate adaptations to enable participation in physical activities and sports.

**Level III**

Children walk using a handheld mobility device in most indoor settings. When seated, children may require a seat belt for pelvic alignment and balance. Sit-to-stand and floor-to-stand transfers require physical assistance of a person or support surface. When traveling long distances, children use some form of wheeled mobility. Children may walk up and down stairs holding onto a railing with supervision or physical assistance. Limitations in walking may necessitate adaptations to enable participation in physical activities and sports including a self-propelling manual wheelchair or powered mobility.

**Level IV**

Children use methods of mobility that require physical assistance or powered mobility in most settings. Children require adaptive seating for trunk and pelvic control and physical assistance for most transfers. At home, children use floor mobility (roll, creep, or crawl), walk short distances with physical assistance, or use powered mobility. When positioned, children may use a body support walker at home or school. At school, outdoors, and in the community, children are transported in a manual wheelchair or use powered mobility. Limitations in mobility necessitate adaptations to enable participation in physical activities and sports, including physical assistance and/or powered mobility.

**Level V**

Children are transported in a manual wheelchair in all settings. Children are limited in their ability to maintain antigravity head and trunk postures and control arm and leg movements. Assistive technology is used to improve head alignment, seating, standing, and and/or mobility but limitations are not fully compensated for by equipment. Transfers require complete physical assistance of an adult. At home, children may move short distances on the floor or may be carried by an adult. Children may achieve self-mobility using powered mobility with extensive adaptations for seating and control access. Limitations in mobility necessitate adaptations to enable participation in physical activities and sports including physical assistance and using powered mobility.

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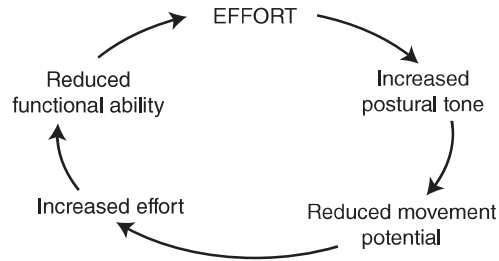
The GMFCS levels are useful in generating an overall prognosis for students with cerebral palsy and in the development of appropriate IEP goals. By knowing what skills or abilities are expected of a student at his or her current level and the next age band up on the GMFCS, the IEP team can carefully consider appropriate goals for the student and use it to guide decision-making. The IEP team should discuss which related service providers would be best able to assist the student in meeting these goals and have a guide for whether or not the student will be likely to reach more independent levels of function over an identified period of time (e.g., within one academic or calendar year). The IEP team should also not make unreasonable assumptions about a significant change in motor performance in a child who is at Level IV or V.

### Quality of Movement

Many students with motor disabilities have diagnoses that involve a loss of motor control and difficulties with motor learning, or the ability to learn new skills that involve initiation or sustained movement. Without going into great detail regarding the neuroscience necessary to more fully understand these concepts, we need to recognize that related service providers who have specialized training and expertise in these areas

**FIGURE 9–4**

Cycle illustrating effect of increased muscle tone on posture and movement



(Scottish Sensory Centre – Marianna Buultgens & Heather McLean (2003)  
*Cerebral Palsy and Visual Impairment (CPVI) in Children: Experience of Collaborative Practice in Scotland*. Reprinted with permission.)

(primarily physical therapists and occupational therapists) should be consulted as part of the IEP team for students who may face challenges in their abilities to move smoothly and effortlessly and for whom motor control and motor learning may impact their ability to fully access their education. Specifically, a student's ability to move against gravity and maintain postural muscle tone or control will require some type of intervention to ensure the student is ready and able to access the educational environment. Postural tone describes an increased activity level in the muscles we use to stand upright and move our limbs against gravity (Shumway-Cook & Woollacott, 2001). To achieve independent movement, we must have sufficient muscle power to avoid forces of gravity while initiating active movement in a specific direction. Our postural tone may decrease, or be lower, when we are fully supported by a comfortable chair and will increase, or be higher, when we are sitting on an unstable surface without back support, such as a rock. Our muscles will have to become actively engaged to support us in an upright position in sitting or standing, and then any effort to move an arm or leg in a specific direction or position will add further difficulty in maintaining postural control. A cycle that illustrates the ways in which posture and movement may become more abnormal over time is illustrated in Figure 9–4.

*Think about the effort that Teo may require as he attempts to use an adapted spoon to feed himself or use isolated finger control to communicate using his assistive technology device. In either situation, Teo must rely on adaptive equipment for external trunk support so that his postural control is sufficient to keep his trunk upright and allow for controlled movement at the shoulder in an antigravity position. Each time Teo attempts these movements, he must exert effort, and the impact of this effort is first noticed by an increase in his postural tone. This increased muscle tone, sometimes referred to as hypertonicity, can reduce movement at the extremities, thereby reducing overall function.*

The next section will describe the impact of abnormal muscle tone on movement and function. Many students with motor disabilities will require assistance to achieve proper positioning and facilitate movement for function. Multiple opportunities for practice and repetition will be necessary to learn new skills and achieve goals related to movement and functional outcomes.

### Spasticity and Muscle Tone

Figure 9–4 shows the process that occurs when infants are born with abnormal tone or when atypical muscle tone is acquired through an accident or injury that damages the neurological system. Beyond postural control, discussed above, an understanding of muscle tone, and its impact on movement is important in identifying how to best address what students with motor disabilities may need to optimize their participation. Many children who have low muscle tone, or *hypotonicity*, were born



**FIGURE 9–5****Definitions and Descriptions of Abnormal Muscle Tone**

*Hypotonia:* decreased muscle tone; usually observed in floppy limbs or trunk, especially when attempting to maintain a position or move against gravity

*Hypertonia:* increased muscle tone; usually observed in stiff arms and/or legs, especially when attempting controlled intentional movements

*Spasticity:* generally used in conjunction with hypertonia to describe stiff muscles that are strongly contracted; identifies damage in the pyramidal tract of the brain responsible for voluntary movement

*Ataxia:* affects muscle control and coordination of movement; results in poor balance and wide-based gait

*Athetosis:* represented by involuntary movements of trunk and extremities; most noticeable as slow, writhing movements that cannot be controlled

prematurely, although this is not the only cause of this type of muscle tone. And many of these same infants actually develop increased tone in the extremities and, to a lesser extent, in the head and trunk over time. As a result, you may see children who started out in life with extreme hypotonicity (low muscle tone), but by school age they may have muscle tone that is described as *hypertonic* or *spastic* (high or tight muscle tone or stiffness). In addition, many children also have a combination of muscle tone with lower tone in the trunk and higher tone, or hypertonicity, in the extremities. Figure 9–5 provides additional definitions and descriptions of abnormal muscle tone.

Furthermore, the cycle of abnormal movement, coupled with adjustments in body position to support antigravity movement or postures, often leads to secondary motor disabilities over time. Physical changes in the muscles and joint structures may result in orthopedic deformities, which induce further development of compensatory patterns, and perhaps more orthopedic deformities. By the time many children with motor disabilities reach school age, they may have secondary motor disabilities and orthopedic deformities in addition to the original motor disability that was present during their infant and early childhood years. You may see students who have hypotonicity, or low muscle tone, in their trunk and head and who rely on numerous supports used in their wheelchair to maintain upright posture. The same student may have hypertonicity, or high muscle tone, in their arms and legs making voluntary movement, such as extending the elbow or knee, very difficult. Over time, the student may develop scoliosis or curvature of the spine requiring additional support of the trunk when seated. In addition, the pelvis, or hips, may be shifted to the right or left (depending on the direction of increased muscle tone) making it increasingly difficult for the student to sit with an even distribution of weight on both the right and left buttocks.

**Position and Restriction**

Many students with motor disabilities will exhibit abnormal muscle tone and will require assistance to achieve proper positioning and facilitate movement for function. Use of adaptive equipment, described in detail later in this chapter, may be necessary to provide the support necessary for trunk stability upon which voluntary movement of the extremities may occur. In addition, equipment may also be necessary to restrict extraneous involuntary movement, as in the case of a child with *athetosis* (see definition in Figure 9–5), for safety of the child or for the potential of facilitating more purposeful movement. Safety is a concern when the involuntary movements of arms or legs could lead the child to knock into walls or other immovable objects with great force.

### Adequate Opportunities for Learning and Practice

Sufficient opportunity for students to perform motor skills within a context is necessary for learning new motor skills and for practicing acquired movements. This means that a particular motor skill must be practiced often enough to become firmly established as “automatic.” When a child is first learning to go up and down stairs, for example, the required movements are made carefully and slowly with deliberate concentration and effort. As the child goes up and down the same stairs again and again, greater skill and precision result from the practice of repeating these movements, and the effort that is required appears to diminish. After much practice, going up and down stairs becomes automatic—a motor skill that is performed without even thinking.

*Teo is able to ambulate up and down a small ramp to get from one area of the school building to another. Teo prefers walking so that he can enter the cafeteria without having to return to classroom after science to get his wheelchair. In order for Teo to accomplish this without taking too much time out of the lunch period, he has had to practice this skill many times.*

Many functional motor skills become automatic or are performed without conscious thought: walking, drinking from a glass, feeding oneself, riding a bike, reaching for objects, washing dishes, or communicating through verbal language or non-verbal cues. In addition to the automaticity, children must learn to generalize the newly acquired motor skill to other situations or settings. Going back to the same example from above of going up and down stairs, we know that the motor skill has indeed been mastered when the child ascends or descends stairs that are slightly different in height, surface, or number from those that were initially used to acquire the skill.

Individuals with motor disabilities can best learn new skills through practice. Opportunities for practice are achieved through repetition and are enhanced through integrating therapy into common routines that occur both regularly and frequently throughout the day. This is known as *integrated therapy*. Team members can all assist by providing opportunities for practice as they create situations throughout the day where a child performs a specific motor skill. These practice opportunities may be incorporated into both physical management routines and participation in typical classroom activities. Children may, for example, lift their arms up before classroom staff put on or take off the tray on the wheelchair, as part of the routine of putting their coat on or taking it off, or reach forward to grab a stationary support bar in the bathroom before being moved out of a wheelchair as part of an assisted toilet transfer. By incorporating movement of the arms into many physical routines, an individual not only partially participates in the care routine but also uses the same motor skill (in this case, lifting the arms up) across routines, thereby practicing this movement numerous times throughout the day.

*Sophie's first grade teacher has created many additional practice opportunities for her to practice the skills she is working on with her physical therapist. For example, she has all of the children lift their arms up many times during morning circle songs and activities, has incorporated this movement into hourly stretches for all children in the class, and requires Sophie to lift her arms up before moving in and out of her wheelchair, putting on her coat for recess, and putting her completed work into the basket on her teacher's desk. These natural opportunities for Sophie to use her arms allow her to learn and practice functional arm use across a variety of situations. Because Sophie's parents, teachers, and therapists all incorporate this arm movement into everything they do with Sophie, they provide more than 100 opportunities a day to practice lifting her arms! This approach means that she will learn to lift her arms up much more quickly than if she practiced this movement only during weekly therapy sessions, and she is also less likely to develop muscle tightness and secondary disabilities in her arms and shoulders as a result.*

As you move through this chapter, we will revisit a number of the concepts introduced in this section to help improve your understanding and acquisition of them, and application of these concepts to students with motor disabilities.

## TEAM SUPPORT FOR STUDENTS

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Professionals from many different disciplines may be involved in working with and assisting students with motor disabilities throughout the school day both in the school building and in the community. Physical therapists (PT) and occupational therapists (OT), speech language pathologists (SLP), assistive technology specialists, adaptive physical educators, vision or hearing specialists, school nurses, or recreation therapists are some of the related service providers who may be involved with these students. These professionals will be part of the team in addition to regular and special education teachers, paraeducators/paraprofessionals, bus drivers, and child care providers, among others. One of the primary challenges for the families of students with motor disabilities is coordination of the many services and supports, especially since the constellation of service providers may reach beyond school and involve a variety of separate agencies in addition to school, including child care programs, home health agencies, outpatient clinics, and respite care. Although these families may have been involved in early childhood programs under Part C of IDEA, and may be expecting the same level of service coordination available in those settings as their child gets older, Part B of IDEA does not include this type of case management. Service coordinators, who were available to help families locate and use a variety of services and supports and to coordinate those services so that they are provided in ways that help promote the progress of infants and toddlers within early intervention, are no longer available after children are in school, leaving the family responsible for service coordination.

### Team Collaboration and Communication

All members of the educational team, including related service providers working with the student, are expected to coalesce as a team and meet at least annually to discuss and develop the student's IEP. Parents are also members of the IEP team, and they are expected to participate actively in the IEP process in an equal capacity. At times, conflicts arise because each professional discipline may view a student's disabilities and the impact on education, as well as the possibilities for intervention that might be necessary to assist the student to benefit from his or her special education, from a different perspective; and sometimes these underlying perspectives result in different priorities or goals when the intent is to have a single IEP developed by the team. For example, an occupational therapist (OT) may determine that a child could produce written work much faster using a computer (keyboard) rather than handwriting in the classroom. Consequently, the OT may propose that the student would most benefit from keyboarding instructions and full access to a computer for all written work. The OT in such a situation would likely want the team to establish goals to improve the child's use of a keyboard as a means of enhancing a child's access to their education. However, the classroom teacher for this same student may see the priorities more aligned with isolated hand movements necessary for developing handwriting. In this example, both the OT and the teacher want to improve the student's performance in the classroom, but they have different approaches as to how they think these goals can best be met. Both professionals recognize the limitation in fine motor skills and the effect of this limitation on activities such as writing, but the occupational therapist is using a compensatory approach to "bypass" handwriting and prepare the child to use an alternative method to achieve competence in producing written work. In the meantime, the teacher wants to use remediation and encourage the child to learn to write using a pencil. Hopefully, the OT and the teacher would

discuss their ideas and approaches with each other and with the rest of the IEP team, and together the team would come to consensus about the student's greatest priorities that should be addressed in the IEP. Perhaps, both can become part of the plan, but if not, other resources for the child to access outside of school may be suggested to the parents. Different perspectives and approaches can coexist when professionals and families work together. After all, the goal is the same under IDEA—assist the child to achieve educational benefits.

Related service providers who have specialized education and training have knowledge and expertise about interventions to address impairments, ways to adapt environments or settings, as well as ideas about compensatory movements or positions that may work best for students with motor disabilities in a particular circumstance. They also know how to adapt materials or change the sequence of steps in a routine to alter requirements or demands of the task. Teachers, family members, and other adults who interact with students with motor disabilities may see these related service providers as sources of information and ideas that can assist them with managing the student's physical needs more easily and with less effort. Sometimes related service providers forget to share this knowledge, and sometimes the teachers or paraprofessionals forget to relay how challenging a physical routine is to accomplish with the student during the day. By engaging in a system of frequent, consistent, and open communication, all members of the team can benefit from sharing information and updates with each other toward achieving common goals.

IDEA regulations define the role of each related service provider and the criteria or qualifications of each. Some of these are very simple; for example, in 34 CFR section 300.34(c)(9), we learn that "Physical therapy means services provided by a qualified physical therapist." While others are more detailed; for example, in 34 CFR section 300.34(c)(6), we learn that "Occupational therapy—(i) means services provided by a qualified occupational therapist; and (ii) includes—(A) improving, developing, or restoring functions impaired or lost through illness, injury, or deprivation; (B) improving ability to perform tasks for independent functioning if functions are impaired or lost; and (C) preventing, through early intervention, initial or further impairment or loss of function" (IDEA, 2004).

Physical therapists and occupational therapists are expected to deliver their services along a continuum that includes not only direct intervention/instruction with the student, but also consultation with other team members to ensure that students have the opportunities to practice prioritized activities and skills regularly. As a result, many therapists have had to learn how to change their role from one of a sole direct service provider to a collaborative consultant who considers how to effectively deliver service both directly and indirectly. As consultants, therapists are collaborating with teachers, paraprofessionals, and family members to address students' physical needs throughout the school day. For example, in planning for an upcoming field trip in the community, the classroom teacher may ask the physical therapist for suggestions to assist a student who uses a walker and struggles to keep up with the class. Similarly, the teacher may ask the occupational therapist for suggestions to assist a student who spends a significant amount of time during recess attempting to don their coat while the rest of the class has already gone outside to the playground.

When therapists help families determine how their children can participate in the activities on the playground or in the local park, suggest ways to engage in community recreation programs, or determine how a young adult can work at a local business, students' social and environmental experiences are broadened, as are their opportunities for learning. Similarly, when general education teachers identify what is difficult within the context of their classrooms, therapists may contribute suggestions or offer strategies that are likely to make the student successful in the situation, reducing the stress on both the student and the teacher. Problem solving by team members with various backgrounds and expertise is important. Many of the challenges that teams need to address do not have known solutions. Instead, the team may have to



**FIGURE 9–6****Options for Communicating with Parents and Other Team Members**

- ✓ Face-to-face scheduled meetings
- ✓ Face-to-face informal communications (hallway “chats”)
- ✓ Written notes in a notebook that “lives” in the student’s backpack or bag
- ✓ Email
- ✓ Text message
- ✓ Phone or conference calls
- ✓ Video calls (e.g., Skype, FaceTime, iChat)
- ✓ Facebook message

engage in collaborative problem solving and think creatively to generate what seems to be an optimal solution (Utley & Rapport, 2002).

Many of the professionals who interact with individuals with motor disabilities do so for only short periods of time in that individual’s life. One set of therapists and teachers may be replaced by a new set when a student moves from early intervention to pre-school or from one school year to the next. Professionals may shift again each time a student moves within the educational system to a new school building—from elementary to middle to high school and then to postsecondary education or work. Families are the constant in their children’s lives and are often the historical memory of what has occurred and been successful in their children’s life (Salisbury & Dunst, 1997). Thus, parents play a vital role as members of the team and should be regarded as “experts.” Figure 9–6 provides options for communication with parents and team members.

Most motor disabilities cross the life span; they often do not go away or decrease with age or as the result of a particular service delivery period. In many instances, motor disabilities become more limiting as the child ages due to secondary changes in body structure that result from poor physical management, insufficient use of adaptive equipment or assistive devices, or over-emphasis on performance of specific motor skills. By working as a team, communicating regularly, and collaborating within and across agencies, we can avoid negative outcomes and work together to obtain positive, if not life-changing, outcomes for students.

### Service Delivery by the Team

In addition to the required components of the IEP where teams provide projected dates for beginning services, anticipated frequency, location, and duration of services and modifications, the IEP should also specify the service delivery model selected to best meet the needs of the student. As an example, we will consider different models of the integration of related services, primarily OT, PT, and SLP, into the student’s school day. These related service delivery models include full integration of therapy by the team throughout the school day, partial integration of services, and delivery of services through a direct intervention model. In the fully integrated model, the student with motor disabilities would receive all special education and related services within the classroom. An instructional assistant, or paraprofessional, may be with the student all or part of the day, and extensive collaboration with any related service providers on the student’s IEP would be expected in the model. In the partially integrated model, the student with motor disabilities would receive most instruction in the classroom as appropriate for the individual student. This is a variable model dependent upon the needs of the student; specific related service providers may incorporate their interventions with the student into the routines of the classroom or may determine that they need to address some of the student’s needs outside the classroom. The direct intervention model may be used when the provider determines

student needs can best be met through individualized intervention reliant on having greater focus on communication, socialization, adaptive behavior, mobility, or life skills. These related services may be provided both within and outside the classroom, and collaboration with the teacher is often needed to ensure that modifications and adaptations necessary for the student are available to facilitate optimal levels of participation (Best, Heller, & Bigge, 2005).

Another way to describe service delivery models would be along the following continuum from most to least direct:

- Individual pull-out
- Small group pull-out
- One-on-one in the classroom
- Group activity in the classroom
- Whole class instruction
- Consultation

Figure 9–7 provides descriptions of what these service delivery models look like in a typical school setting.

**FIGURE 9–7**  
Descriptions of Service Delivery Models

<b>Individual pull-out</b>	Therapists take an individual student out of the classroom to another room or location in the school building or on the playground. The student receives intervention focused on specific needs identified in his/her IEP for approximately 30–45 minutes (time varies) and then the student returns to the classroom setting. This approach may be essential when the student has very specific needs; is distractible or distracts peers around him/her; or when the intervention requires equipment, space, or other unique environmental features.
<b>Small group pull-out</b>	Therapists take a small group of students with disabilities, who all have similar needs for intervention as identified on their IEP, out of the classroom to another room or location in the school building or on the playground. The students receive intervention focused on specific needs for approximately 30–60 minutes (time varies) and then return to the classroom setting. These students may all be from the same classroom, or they may spend most of their day in several different classrooms, but they come together for this therapy session outside the classroom, which functions as their “academic home.”
<b>One-on-one in the classroom</b>	An individual student receives intervention focused on specific needs that have been identified in his/her IEP within the classroom setting. At times, the intervention may be directly linked to activities or instruction occurring in the classroom at that time (as a parallel), or the student may be involved in activities that are different than what the rest of the class is doing (as an alternative). The primary point here is that the student does not leave the classroom, and the therapist works directly with one student in that setting.
<b>Group activity in the classroom</b>	A small group of students with disabilities, who all have similar needs for intervention from a therapist as identified on their IEP, receive intervention focused on their collective needs within the classroom setting. At times, the intervention may be directly linked to activities or instruction occurring in the classroom at that time through co-teaching or parallel instruction, or the group of students may be involved in an alternative activity or instruction from the rest of the class (Friend & Bursuck, 2009). The primary point here is that the students do not leave the classroom, and the therapist works directly with the group of students in that setting.
<b>Whole class instruction</b>	The therapist or other related service provider engages the whole class in an activity that has been designed to meet the specific needs of one or more identified students, but in which all students participate. The therapist may co-teach the whole class, or the therapist and the teacher may work together to best manage the classroom, while they are both focused on the same activity, lesson, and outcome for individual students and the collective whole. (Bauwens & Hourcade, 1997; Magiera & Zigmond, 2005; Zigmond, 2001; Wilson, 2005; Friend & Cook, 2007; Friend & Bursuck, 2009).
<b>Consultation</b>	The therapist or other related service provider is considered as an expert of their discipline able to assist the classroom teacher in identifying or solving problems as a component of addressing the needs of the individual student. The teacher and related service provider may interact in a collaborative relationship; however, this is not always the situation. Regardless, success in delivery of services through consultation will be dependent on the ability of the collective expertise to address problems (West & Idol, 1987; McWilliam, 1995).

Not only do we need to consider the setting and model of service delivery, but we must also be cognizant of the extent to which IEP goals are developed by a team, including parents, written in a manner that addresses a skill necessary (in both academic and functional areas) and appropriate for the student. Goals should be positive; emphasizing what the student will do, the conditions under which the student will perform the skills, and be both measurable and observable in order to know when the student achieves the goal.

Here are some examples of an IEP goal written for Sophie and Teo:

Sophie	Teo
During playtime, Sophie will communicate her continued interest in an activity by reaching and touching a switch that activates a recorded voice.	When in the bathroom, Teo will independently come to stand and transfer to the toilet.

## MEETING STUDENTS' NEEDS

Physical assistance and management is an important component of educating students with severe disabilities. It refers to the physical support, techniques, and strategies that facilitate student safety, inclusion, and participation in typical school activities and routines. Developing strategies for safe and efficient physical assistance and management should be a collaborative process that can potentially include the student, family, teacher, paraprofessional, physical therapist, occupational therapist, school nurse, and other relevant team members. The strategies developed can be described as physical management routines. Figure 9–8 outlines the goals of physical assistance and management at school. In educating students who have motor impairments, it is important to consistently implement physical management routines. Written or pictorial instructions may be created to facilitate use of the routine in multiple environments and with a variety of staff members.

*Sophie has a laminated set of cards with pictorial representations of each part of her school day. These are held together using a ring clip and cards can be added or eliminated from the set as needed. The cards are used by all team members and Sophie's peers to not only tell her what is coming next, but also to show her a simple visual of the next activity or task. Additionally, the cards can be used to allow Sophie to select between two cards at appropriate opportunities that allow for her to make choices and communicate her selection to adults or peers around her.*

Repeated practice of specific skills in a variety of contexts has shown to be a fundamental requirement of motor learning (Valvano, 2004). At school, students have frequent opportunities to practice skills that facilitate their participation in meaningful daily activities such as self-care, transfers, learning, and play. These important learning opportunities can be maximized through the consistent use of physical assistance and management routines.

As described in the first section of this chapter, the ICF framework provides a helpful guide to understand the relationships between the student, the environment,

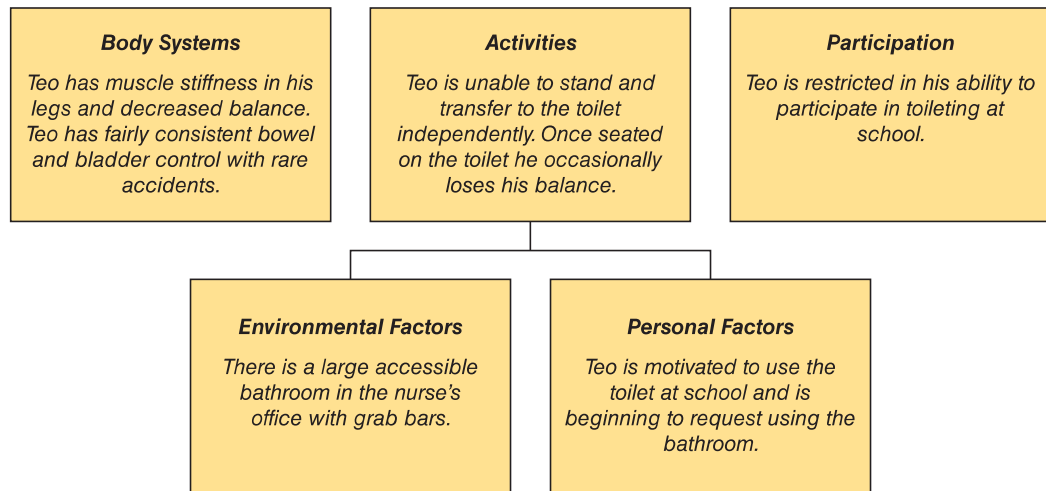
**FIGURE 9–8**

Goals of Physical Assistance and Management

- Safety of student and staff
- Increase student participation in school activities
- Provide opportunities to learn skills that improve proficiency with daily routines

**FIGURE 9–9****Using the ICF Model to Evaluate the Toileting Routine for Teo**

Teo is rated at GMFCS Level III and, based on evaluation data, his functional skill level is commensurate with other students his age at this GMFCS level. It is likely that Teo's gross motor skills will not significantly improve.



and the task. This is critical information necessary in designing a physical management routine. The body structure and function component identify activity limitations and participation restrictions that require development of a physical management routine. Activities the student is able to perform successfully can also be identified and incorporated to increase their independence with the routine. Environmental and personal factors important in physical management routine development are also identified using the ICF. For example, the physical layout of a bathroom will impose both opportunities and limitations on the methods used during a toileting routine. Personal factors, such as how meaningful the activity is to the student, may affect the student's level of interest and consistency of participation. Figure 9–9 shows the use of the ICF model for evaluating a toileting routine for Teo.

### Daily Routines

Students with motor disabilities often receive direct and/or indirect physical and occupational therapy services at school to help develop physical management routines. The most appropriate service delivery model based on the student's needs, goals, and prognosis is important to consider. Direct services are most often provided when gains in functional skills can be expected based on the student's prognosis and developmental progression. Indirect services, as described earlier in this chapter, are provided on behalf of the student in the form of consultation with school and community-based teams, development of accommodations and modifications, obtaining necessary adaptive equipment, and improving student self-advocacy. Indirect services may be provided to facilitate access to school environments and curriculum after no further gains in student skill levels are anticipated. Figure 9–10 provides examples of how information on prognosis can help guide goal development and the interventions that will help the student reach those levels of independence. Student needs and use of appropriate service delivery models may change over time. In fact, ensuring that a student has sufficient opportunities and practice to learn a new skill may necessitate a flow between direct and indirect, or a combination of, services during an IEP period as well as from one IEP period to the next.

Students with motor impairments often have many skills and goals that they must work on simultaneously. In order for the student to accomplish goals and achieve



**FIGURE 9–10**

Using Prognosis to Guide Goal Development and Service Delivery

Current Level of Performance	Functional Goal	Service Delivery	Rationale
Teo feeds himself ½ serving of pureed food by accepting adapted spoon from staff and bringing it to his mouth after food has been placed on the spoon. He eats in a quiet classroom environment.	Teo will scoop food and feed himself one serving of pureed food using an adapted spoon while in the cafeteria with his peers.	Minimal direct service provided for evaluation of required adapted utensils. Indirect service provided to develop plan to increase Teo's endurance for self-feeding in the distracting cafeteria environment, train staff, and provide ongoing consultation.	Teo is motivated to be in the cafeteria with peers and has been increasing his oral intake.
Teo requires physical assistance when transferring from his wheelchair to his walker. The staff provides verbal instructions to Teo for each step of the transfer routine.	Teo will use his communication device to request moving to his walker and choose two specific instructions to give to staff. Teo will continue to require physical assistance.	Indirect service provided for adding needed options to communication device and staff training and consultation	Based on Teo's GMFCS level, prior physical therapy interventions, and his age, he will likely continue to require physical assistance for transfers. However, improving his self-advocacy is a reasonable goal based on his current communication skills and anticipated needs for community living.

success in and out of the classroom, the IEP team will need to work collaboratively to carefully integrate goals and the strategies to achieve these outcomes across multiple situations and settings throughout the school day. Students will be more motivated when they have opportunities to make choices. Therefore, the team should attempt to provide options for the student when possible and reasonable.

**FIGURE 9–11**

Rifton Blue Wave Toileting System



Photo: Amy Barr

*Teo prefers to walk into the cafeteria and sit in a regular chair at a table to socialize during his lunch period. In order to have this choice, he must commit himself to packing up all his materials before the end of the class and moving quickly to the cafeteria when the bell sounds.*

### Self-Care

Self-care involves routines that are part of our daily lives. These routines are generally managed independently beginning at relatively young ages. However, for students with motor disabilities, many of these routines require special equipment or assistance. Figures 9–11 and 9–12 are examples of such equipment. As students

**FIGURE 9–12**

Snug Seat Manatee



Photo: Maria Jones

get older and they mature physically, many of these routines may become more complex and personal. Team members will work together to make modifications to address any concerns that may arise during the performance of such routines.

*For example, now that Teo is 16 years of age, it has become less desirable for him to have adult females assist with his toileting needs during the school day. Teo is working hard to manage the most personal aspects of the toileting skills independently and to rely on assistance for the transfers and more difficult aspects of securing his clothing at the end.*

### Toileting/Diapering

Toileting and diapering routines are an essential part of a student's day. Proper positioning can promote alignment while providing postural support necessary for toileting. The student and family play an important role in sharing information regarding toileting and diapering frequency and methods used at home and in the community. This information is an important starting place in developing routines at school that will meet the students' needs and facilitate their comfort. Students with motor disabilities often achieve bladder and/or bowel control at a later age than their typically developing peers and excessive degrees of muscle tone can influence and sometime prevent elimination. Therefore, ensuring that students have adequate postural support to facilitate elimination and developing routines that are age-appropriate and that respect the privacy of the student are important. Students using a toilet typically require an accessible bathroom and may require specialized seating systems designed for bathroom use. These seating systems provide postural support so the student can sit safely and comfortably over the toilet. Grab bars or other equipment may also be required for the student to move safely to the seat.

Students who are diapered need access to a clean surface where they can lie on their backs to be changed. Surfaces, such as a changing table or other type of plinth, are often used because changes cannot be accomplished well from a sitting position. Students who become stiffer when lying on their backs will often need a small pillow under their head to prevent excessive extension and to make managing the diaper easier. For students who are diapered, their routine should include any components of the task they can perform themselves, such as rolling or lifting their hips to assist in their care. Handwashing is an important life skill and including it in the toileting and diapering routine is not only a good way to reinforce personal hygiene, it also provides repeated practice opportunities for learning the skill.

### Eating

Sharing a meal or snack with peers is a social experience as well as a nutritional one, so ensuring the location and method of eating facilitates this social interaction and is an important consideration in developing mealtime routines. Many students with motor disabilities eat orally but may have difficulty controlling and coordinating the muscles of their face, mouth, and throat. This can cause challenges for the student when manipulating and swallowing food. Positioning the student in good alignment and with appropriate support for eating is important. Ideally, the student's head should be in the center of his or her shoulders, neither falling forward or backward, and his or her shoulders and trunk should be centered above the hips. Back support and/or head support, either from the student's wheelchair or other adaptive chair, will likely be required. Adapted utensils or dishes may also be necessary to facilitate successful participation of the student in scooping food and bringing it to his or her mouth. These adaptations are often designed and monitored by the occupational therapist, physical therapist, and/or speech therapist working with the student.

For other students with severe motor disabilities, eating food orally may result in excessive choking, coughing, or biting (as a reflex) making this an ineffective or

even dangerous way to ingest daily calories and nutrition. In those situations, the student may require feeding through a tube that delivers adequate nutrition directly to their digestive system. When a student is *tube-fed*, staff members are typically trained by the school nurse and/or family to perform this task safely and within physician-specified guidelines to ensure the student's medical and nutritional needs have been met.

### Dressing

Dressing activities at school can take on many forms including taking on and off a coat or hat, raising and lowering clothing during toileting, and applying or removing orthotics or shoes. Developing physical management routines to support dressing provides opportunities for students to learn important life skills through repeated practice in their natural environment. Most school-aged children perform dressing activities either sitting or standing. For students with motor disabilities, sitting provides the additional stability they need to more freely move their arms and trunk in ways necessary to participate in dressing routines and is a more active position than lying on their backs (where students are often more passive). As with other daily routines, development of dressing routines should incorporate the portions of the task the student can perform with some level of proficiency.

### Lifting, Transferring, Moving

Students with motor disabilities may be unable to independently stand, move, and transfer from one surface to another and will often require some form of assistance. This assistance may be physical support from staff and/or equipment designed to help lift or move a student. Although the best method to lift or transfer a student is dependent upon the student's specific abilities and the contextual factors of time and the environment, caregivers should apply basic principles in every situation to maximize the safety and comfort of both the student and caregiver. Adequate planning is the most important step to ensure that moving a student will be safe and comfortable for all involved. The time to find out if the wheelchair brakes are locked is not in the middle of a transfer but rather before any movement has begun. Methods for moving students should be developed collaboratively by the education team. Staff-training by the physical therapist and written or pictorial instructions are often required to increase consistency of implementation.

### Preparation for Movement

When the student has not initiated or requested being moved, but they need to be moved, *it is important to first gain the student's attention*. This is often accomplished by saying the student's name, making eye contact, and/or establishing physical contact. The student should be informed of what is about to take place such as "It's time for our class to go to the gym for physical education, so I will help you into your gait trainer." This is the time to make sure that all equipment is in the best location for the transfer to take place. In general, when transferring, lifting, or otherwise moving a student, it is best to minimize the distance that the student must travel or be carried. It is also helpful to minimize the height difference a student must travel between two surfaces or pieces of equipment. For example, when assisting a student onto a changing table, lowering the table height to that of the student's wheelchair so that the adult does not have to lift the student against gravity is ideal. Once the student is positioned on the changing table, staff can adjust (assuming this is an available option) or raise the table surface to a level where the staff can help complete the self-care routine at a comfortable height without back strain. If the table has rails or any other features to increase the safety of the student, these should always be available and used.

Wheelchairs, standing tables, or other positioning equipment with wheels should always be locked prior to moving a student. Some students who have increased muscle tone (hypertonicity) or stiffness (spasticity) may benefit from verbal reminders to relax their body in preparation for movement and may require a few additional seconds to allow their body to respond as they attempt to accomplish this task. When requested to complete certain components of the transfer, the student may also require increased time to respond with the appropriate action. Classroom staff may use specific preparatory physical movements designated in the physical management routine to help decrease a student's muscle stiffness and increase their participation in the lift or transfer. For example, prior to lifting Sophie, the paraprofessional has learned to gently bend both of Sophie's legs at the same time, and slowly rock her hips from side to side.

### Lifting and Transferring

When assisting students with lifts and transfers, applying some basic principles can serve to keep both students and staff safe. It is best for any adult who is assisting to be at the same height as the student. For example, when lifting a student from the floor, the paraprofessional should bend their knees and move their body down and as close to the level of the student as possible. Using their arms to provide support and securely cradle the student's trunk and legs is the next step before rising up to standing by using strength in the powerful leg muscles to push up into a full standing position. This method decreases the amount of stress on the adult's lower back. It is also important to keep the student's center of gravity (located around their navel) reasonably close to the body of the staff member. This allows increased control of the student's body, improves the student's comfort, and decreases the effort of the person responsible for the lift. For example, while it may be possible to transfer a young student with outstretched arms, this can make the student less stable during the transfer and cause repetitive strain on the lower back muscles of an adult attempting to lift or carry weight that is too far out in front of their own center of support. Moving a student by grasping, holding, or lifting them from their elbows, wrists, or under the shoulders should be avoided, as this can lead to damage of these smaller and more vulnerable joints. Students with muscle weakness or low muscle tone (hypotonicity) are at particular risk for injury. Communication with students throughout the lifting and transferring process is beneficial to assure the student can anticipate the next steps or movements as well as participate to the maximum extent possible.

### Completing the Movement

After completing the transfer or lift, the student must be positioned comfortably and securely on the new surface or in the equipment. Seatbelts or other safety measures, including supporting straps and wheelchair foot rests, should be fastened as needed with the student participating in these activities based on their abilities.

### Positioning

Positioning refers to supporting the student's posture as he or she sits, stands, or lies down. This support, called positioning, can be defined by the need for external control of the body's alignment in relationship to gravity within the environment to complete the task at hand. Appropriate positioning allows students to better engage in academic, functional, and communicative tasks (Cheng et al., 2013; McEwen, 1992). Teams should evaluate positioning within these routines and use equipment that supports students with motor disabilities so they can easily perform movements necessary for the routine. For example, Teo uses his communication device most efficiently when positioned in his wheelchair, which provides



**FIGURE 9–13****Goals for Positioning**

- ✓ Promote good postural alignment
- ✓ Provide access to educational environments and tasks
- ✓ Accommodate fixed deformities
- ✓ Protect skin integrity

good trunk support, enabling his arms and hands to more freely access his device. Positioning allows the student to maintain better alignment with less muscle fatigue than would be possible without support; this may avoid or minimize the development of secondary conditions such as joint stiffness or deformity. For students who have already developed secondary conditions, such as a structural scoliosis (curvature of the spine), appropriate positioning of their trunk accommodates for these changes and provides support and comfort. You may have seen a student in a wheelchair who has a plastic and foam brace (orthotic) around his or her trunk, or a student with a complex series of pads and support straps built in to the back support of the wheelchair, who requires this trunk support as an important part of his or her seated position. By having a well-supported trunk, the students can use their arms, avoid fatigue and further leaning to the right or left, and maintain an upright position to facilitate talking, swallowing, and chewing among other movements. Skin health is another important consideration in positioning, as students with motor disabilities and secondary musculoskeletal deformities are at risk for skin breakdown caused by prolonged pressure over bony areas. Figure 9–13 describes the goals of appropriate positioning.

To accomplish the goals described above, positioning systems are typically used to provide the support that students need. Many students with motor disabilities have a wheelchair with a positioning system that they use at home, in the community, and at school. However, just as a typically developing student does not sit in one position all day, a student with motor disabilities also requires the opportunity to change positions. These position changes should be based on the student's schedule and typical school activities. Position changes may be related to self-care tasks performed during the day, or be required for the student to participate in a specific environment such as completing a modified warm-up exercise program in physical education class. A written physical management plan related to positioning is often helpful for the team in understanding the student's needs for position change, the types of positions that can be used throughout the day, and the timing with which change should occur.

Students may use adaptive chairs (Figure 9–14), standing systems (Figure 9–15), or be positioned on the floor (Figure 9–16) during specified periods of the day and/or to complete certain academic, learning, or functional tasks as appropriate. Working together as a team to create a schedule that is reasonable for the adults who will be moving the child and appropriate for the student's learning needs in different classroom settings is beneficial. For example, taking a student out of the wheelchair and positioning him or her in a resting position on a mat may be necessary for pressure relief to his or her bottom at least twice during the school day. If this student is

**FIGURE 9–14****Leckey Easy Seat**

Photo: Maria Jones

**FIGURE 9–15**

Bantam Stander with Tray

Photo: Maria Jones



participating in several academically based high school courses, creating a schedule that does not conflict with the academic courses but occurs at a time when the student might have an “off” period is important.

*Sophie requires opportunities to be out of her wheelchair each day. One option is for Sophie to stand in a supine stander that provides support from behind her head, trunk, legs, and feet and that is placed at an angle of 90 degrees or less to the floor. The stander facilitates social interactions with peers for Sophie as she is at the same height and her friends are drawn to interacting with her when she is standing. Physiological benefits to a standing program such as maintaining or increasing bone mineral density have been documented (Pin, 2007). The physical*

*therapist established a physical management routine in collaboration with the education team and provided training on moving Sophie in and out of the stander and positioning her correctly. The team determined that the most appropriate times for Sophie to use the stander are during physical education class or when working on activities developed by the vision specialist. Sophie’s physical management routine for standing is described in Figure 9–17.*

### Learning

The majority of a student’s school day is spent in the classroom learning and therefore many physical management routines are completed in this setting. When planning the

**FIGURE 9–16**

Special Tomato Floor Sitter

Photo: Maria Jones



physical management of a student with motor disabilities in the classroom setting, keep in mind the two primary roles of all students: They are both *learners* and *classmates*. Physical management routines should promote the student’s participation in learning activities and social interactions. Students with disabilities should have eye contact with their peers and teachers and be able to see, hear, and interact with learning materials in a similar fashion as other students in the classroom. The instructional requirements and adaptations necessary for learning are covered in other chapters in this book. The physical adjustments and modifications that a student may require to promote learning and social interaction throughout the day are important considerations.

In the early primary grades where instruction and sharing are often done on a carpet in the classroom, seating students with disabilities on or near the floor to facilitate their participation in these activities is beneficial. This often requires positioning equipment designed especially for floor-sitting (Figure 9–16). Similarly, a student who uses a wheelchair for academic activities at a desk must be able to access the supporting surface of the desk from his or her wheelchair. The classroom desk may need to be raised or lowered to enable the student to access the desk surface. In some situations, the student may require an adaptive desk to complete academic tasks. Occupational therapists and physical therapists, in collaboration with other team members, can recommend and provide training on specific equipment.

**FIGURE 9–17**

Sophie's Physical Management Routine for Preparing Her to Stand

Staff Tasks	Sophie's Tasks
<i>Transfer to Stander</i>	
<ul style="list-style-type: none"> <li>• Lock wheelchair and stander brakes.</li> <li>• Inform Sophie of plan to move her to stander.</li> <li>• Remove seat belt and chest harness.</li> <li>• Lift Sophie from wheelchair and position her supine on stander.</li> <li>• Secure pelvic and chest straps.</li> <li>• Secure knee supports.</li> <li>• Secure foot straps.</li> <li>• Raise stander to 80 degrees.</li> </ul>	<ul style="list-style-type: none"> <li>• Flex head forward to allow staff to place arm behind head and upper back.</li> <li>• Keep arms in middle of body during lift.</li> <li>• Indicate by smiling if she is comfortable once in stander.</li> </ul>
<i>While Standing for 30 Minutes</i>	
<ul style="list-style-type: none"> <li>• Monitor Sophie's position and comfort.</li> <li>• Present activities for Sophie to complete.</li> </ul>	Complete activities such as visually tracking lighted toys, attending to language arts activities when used with a light box, and grasp and release tasks.
<i>Transfer to Wheelchair</i>	
<ul style="list-style-type: none"> <li>• Inform Sophie of plan to lower her down.</li> <li>• Lower stander to horizontal position.</li> <li>• Remove foot straps.</li> <li>• Remove knee supports.</li> <li>• Remove pelvic and chest straps.</li> <li>• Lift Sophie from stander and position her in wheelchair.</li> <li>• Secure seat belt and chest harness.</li> <li>• Remove ankle foot orthoses and check skin condition.</li> </ul>	<ul style="list-style-type: none"> <li>• Keep arms in middle of body during lift.</li> <li>• Indicate by smiling if she is comfortable in wheelchair once positioned.</li> </ul>

When considering physical management routines, strategies that promote the students' participation in the same activities and environments as their peers are a priority. Figure 9–18 presents a hierarchy of adaptations and modifications to activities and routines. Strategies at the top of the list promote full inclusion in activities and environments with peers, and those lower on the list address adaptations or modifications that provide alternate activities or environments to the student with disabilities. Using a hierarchy of strategies is helpful to educators and specialists as they collaborate on physical management strategies. Many students with motor disabilities require extensive modifications and adaptations to the general education curriculum; therefore, adults may begin at the bottom of the hierarchy without giving adequate consideration to simpler strategies that will still maintain learning and social opportunities with peers in the least restrictive environment (Campbell, 2010). Although the educational team may determine that alternative activities and environments are the most appropriate, they should make such a determination only after thoughtful consideration of a range of options (McEwen, 2009).


### Ecological Inventory

An ecological inventory is a flexible tool that can be completed for any school activity or routine (Brown, 1979). The inventory consists of structured observations of the student, his or her environment, and the tasks he or she needs to perform during the school day. These observations help determine what skills, modifications, or adaptations the student needs to improve his or her participation. The information gathered using this type of inventory is invaluable for designing management routines that are student specific and facilitate active participation in a variety of settings. Ecological inventories can be completed by a teacher or a specialist who is familiar



**FIGURE 9–18**

Accommodations and Modifications in the Classroom

Hierarchy of Accommodations and Modifications	
<b>Provide environmental accommodations.</b> <ul style="list-style-type: none"> <li>• Adapt setup.</li> <li>• Adapt tools or equipment.</li> <li>• Provide positioning equipment or adaptations.</li> </ul> <b>Modify schedule.</b> <b>Select or adapt activity.</b> <b>Modify requirements or instruction.</b> <b>Provide peer assistance/helper.</b> <b>Have individual child do a different activity in the typical environment/context.</b> <b>Provide adult assistance.</b> <b>Have individual child do something outside the typical context with an adult.</b>	<p>Least Restrictive</p>  <p>Most Restrictive</p>

(Modified from Accommodation and Adaptation Framework [Campbell, 2010]).

with the—student's abilities and typical skill performance. They can also be completed collaboratively by several team members who all know the abilities of a student, such as the classroom teacher, physical therapist, and paraprofessional. An ecological inventory completed the first week of school for Sophie's sign-in routine is shown in Figure 9–19.

### Playground and Recreation

Play and recreation are important activities of childhood and provide opportunities to develop both social and motor skills (Mancini & Coster, 2004). You may not be surprised to learn that students with multiple disabilities have the lowest rates of participation in a wide variety of school activities, including playground and recreation activities (Simeonsson, Carlson, Huntington, McMillen, & Brent, 2001). For pre-school and elementary school children, playground activities often include climbing, sliding, playing running games, and riding tricycles. For middle and high school students, recreational activities typically become less oriented around physical games and more focused on social relationships. Students may also participate in unified or adapted sports, physical education classes, and community sports and recreation programs.

When promoting playground and recreational participation, teams must consider the student's goals. Typical goals include increasing motor skill proficiency, increasing general physical fitness, and socialization with peers. Balancing these priorities with other student goals related to academics and functional life skills is important for the IEP team to consider in their decision-making and goal-setting. As in other school settings, teams can modify the activity or the environment to promote increased participation in recreation and play. The student can also be taught physical skills and game rules—a strategy we do not always think to incorporate, but one that can be beneficial to increasing participation and positive peer interaction. Modifications may include the student using a particular piece of equipment during a game, such as a dynamic stander, or modifying the structure, format, or rules of the game itself. For example, using a baseball tee instead of having the student hit a pitched ball or using bumpers in the gutters at a bowling alley are equipment and rule modifications that may help a student participate alongside peers. Even when students require adult assistance to participate in playground and recreation skills, the social component of play should be integrated as much as possible, allowing students to interact and have fun with their peers.



**FIGURE 9–19**

Ecological Inventory for Sophie's Sign-In Routine

Completed by classroom teacher, physical therapist, vision teacher, special educator			
Task	Environment	Sophie's Current Participation	Plan
Identify laminated index card with her name.	Cards are secured to wall with Velcro. There is a small table next to area, which limits usable space in front of wall.	Sophie cannot identify her written name but is beginning to smile at pictures of familiar people.	Sophie's name card and font size will be enlarged and her picture will be added next to her written name to help her identify it. The table will be moved away from the area to allow Sophie to get close to the wall in her wheelchair.
Move card from "home" column to "school" column.		Sophie requires hand-over-hand assistance to pull card from wall and move it to school column.	A small foam ball will be adhered to the back of the name card so that Sophie can grasp it easier and pull it from the wall. The classroom teacher will remove the school column and make a school basket for the students to put their names into. Sophie's will likely continue to require physical assistance provided by the paraprofessional.
Make lunch choice by placing a tally mark on the whiteboard under the written choice.	Whiteboard area is large and wheelchair accessible.	Sophie requires hand-over-hand assistance to remove cap from pen, make tally mark, and replace cap.	This task was eliminated from Sophie's sign-in routine as she does not eat food by mouth and therefore a lunch choice is not meaningful to her. She also requires increased time to complete the bell starter worksheet and to be positioned appropriately for circle time so the extra time is used for these activities.
Sit at desk and complete bell starter worksheet.	First grade desks have storage compartment under tabletop, which prevents Sophie's from sitting at her desk with good positioning.	Sophie sits at instructional table near back of classroom so her wheelchair can fit underneath.	A wheelchair desk with side storage compartment will be provided. Sophie will sit at a desk next to her peers to complete bell starter worksheet modified by special educator.
Place worksheet in teacher's basket when complete.	Basket is on edge of teacher's desk. Aisle is too narrow for Sophie to approach it in her wheelchair.	Paraprofessional is placing completed work in teacher's basket.	Classroom desks rearranged to provide two larger aisles that are wheelchair accessible. One leads to the teacher's desk and one to the carpet circle area.
Sit on carpet for circle time.	Sophie is unable to sit on the carpet safely due to decreased muscle strength and balance.	Sophie is sitting in her wheelchair at the back of the carpet area.	An adaptive chair that sits on the floor and provides head and trunk support for Sophie will be provided. She will be positioned in this chair by the paraprofessional during circle time. Sophie will sit at the end of a row allowing the paraprofessional to sit nearby and facilitate her participation as needed.

### Transition to Employment or Other Postsecondary Settings

A transition plan must be part of a student's IEP when they turn 16 years old but may begin earlier (IDEA, 2004). The plan identifies students' postsecondary goals as well as their strengths, interests, and needs. Postsecondary goals may include employment, adult living environments, or academic settings. School coursework, skills taught, and IEP goals should be clearly related to postsecondary outcomes. Physical

therapists and occupational therapists may be involved in assessment of the student's motor, mobility, and self-care skills. Additionally, they help determine the need for and are able to obtain necessary adaptive equipment and/or environmental modifications for achievement of the student's postsecondary goals. Therapists should perform assessment and interventions in the community, on the job, or in academic settings to determine the students' needs in the environments where they will likely be living and working.

*Teo and his family have identified two postsecondary goals. Teo would like to live in a group home with other adults with disabilities, and he would like to find meaningful work, either as a volunteer or paid employee, in his community. Teo started a job-shadowing program several hours per week to explore his interests. Teo also needs to learn community living skills to live in a group home and travel by public transportation. To identify needed skills, the special educator, physical therapist, and occupational therapist completed a functional skills assessment. The assessment data indicated that sorting clothes and loading clothes into washing machine, carrying items on a tray, and wheeling himself on and off a bus lift are needed skills to meet his postsecondary goals. These skills were discussed with the family, student, and school team and integrated into his transition plan and goals on his IEP.*

### Use of Equipment to Enhance Participation

Earlier in the chapter, you read about some pieces of adaptive equipment that teams use to promote the student's participation in self-care routines or in learning. In this section, we will continue to describe types of equipment and the ways students use this equipment, including assistive technology devices, in schools.

Students with disabilities often use adaptive equipment, also known as assistive technology, to address their unique needs and allow them to participate in daily activities and routines. Adaptive equipment has three major purposes:

1. Prevention of secondary problems and conditions, including postural deformities
2. Increasing use of motor skills
3. Improving participation in activities and routines in home, school, and community settings

Sometimes, conflict may occur between these purposes. For example, many students with severe motor disabilities can perform functional arm and hand skills best when in a sitting position, resulting in their being seated most of the time they are in school. Also, sitting may be the easiest position in which to manage a student with motor disabilities across different environments. When Sophie first enrolled in preschool, she had difficulty sitting on the floor during "circle time" or play. The school obtained a special adapted chair for Sophie's functional positioning at school (Figure 9–20)

Even though sitting may be the ideal position for most activities, when students spend most of the time in only one position, secondary impairments, such as muscle tightness or a permanent shortening in the length of hip and knee muscles (contractures), may develop (even when equipment is well fitted and used appropriately). Such secondary problems cause the hips and knees to remain in a flexed (or bent) position and prevent them from extending (or straightening), which can then lead to problems for students when trying to stand or lie on their back or stomach. To prevent students from spending all their time in one position, teams will often incorporate alternate positions and types of equipment into the classroom to position students throughout the day. Alternate positions for sitting are those that place, or position, joints of the body in opposite alignment or with opposing forces of gravity. Standing or lying on one's side, stomach, or back straightens the hips and knees and extends muscles in the opposite direction.

Teams must consider the appropriateness of a position in the setting and activity in which the student will use the position. They should also consider the effect the

**FIGURE 9–20**

(a) R82 Hi-low Base with Lecky Seating and (b) R82 Hi-low Base with Lecky Seating (elevated)



(a)



(b)

Photos: Maria Jones

position may have on adult and peer interaction with the child (McEwen, 1992). Young students, especially, should be at the same level as their peers so that they can play and learn with students who do not have physical disabilities in child-care, preschool, or community settings. Older students, on the other hand, may benefit from being out of their wheelchair; however, positions lying on the floor may not be conducive to their interaction with peers and participation in an academic high school classroom in addition to being inappropriate, embarrassing, and stigmatizing for a student at this age.

*Positioning Teo, a high school student, in a side-lying position during art class is not socially appropriate, even though the position may work well for him and the equipment is available. Side-lying is a good position to use for watching TV at home, for sleeping, or for just relaxing. Standing is the best alternative to sitting for a majority of settings.*

Most students with severe motor disabilities require different types of positioning equipment at home and as they begin child care or school. For example, they may need positioning support when sitting on the floor, sitting in a chair, standing, moving about, or toileting. A variety of equipment is available for positioning with new products being introduced each year. Related service providers, such as physical therapists and occupational therapists, should be called upon to assist school personnel, IEP teams, and families in identifying and selecting the most appropriate equipment for a student (Figures 9–11, 9–12, 9–14, 9–15, 9–16, 9–20, and 9–21).

Students with motor disabilities may require equipment to support their participation in activities with their families, friends and alongside their peers in the community. Although the Americans with Disabilities Act led to major improvements in accessibility, not all environments and settings are accessible and students may need adaptations to enhance their participation.

*Teo can get to any bathroom independently in his manual wheelchair but often cannot get through a standard doorway, which is likely to be too narrow to accommodate his chair. Sometimes when visiting a museum or another community building, he is unable to get in the building unassisted because of steps or ramps that are too narrow for his chair, so he uses his four-wheeled rear walker to access those environments.*

All settings are not fully accessible or don't accommodate all types of equipment. Physical therapists, occupational therapists, and other specialists need to design alternate strategies to overcome architectural barriers when those situations arise. Lifting and carrying may be needed in some environments even when individuals are independent in others. As discussed earlier in the chapter, partial or full independence in self-care routines such as toileting, eating, bathing, etc. may be possible only through environmental accommodations, use of adaptive equipment for positioning (e.g., wheelchairs, toileting chairs, bathing chairs), assistive devices (e.g., grab bars around the toilet, adapted handles on the sink faucets, special plates and utensils, bars around a person's bed, a washcloth mitt), or other such aids. Students may be



more dependent in a routine when the environment has not been designed or fully modified for accessibility by individuals with physical disabilities or when needed equipment and devices are not available. When the environment or circumstances are less than ideal for a student, the team should collaborate to find solutions.

*When Teo needs to use a restroom in the community, his toileting routine is more difficult than when he is at home or at school where he has a modified toilet seat readily available. In the community, he can still communicate his needs using his communication device, and he can use his wheelchair or his walker to get into the bathroom independently. Once on the toilet, however, someone has to support him; this is unnecessary at home or in school where he is more familiar with the setting and has equipment in place.*

### Determining Appropriate Equipment

The use of equipment for proper positioning is essential for most students with severe motor disabilities. Therapists often recommend positioning systems to ensure proper alignment to promote improved function, movement, and participation in routines. Well-aligned posture results from control of muscles that maintain the body in positions against gravity. The positioning supports that students require depend on the severity of their motor impairments; some will need few supports that can be easily made or purchased, and others will require extensive and highly specialized equipment that has to be custom-ordered (Breath, DeMauro, & Snyder, 1997; Rainforth & York-Barr, 1997; Trefler, Hobson, Taylor, Monahan, & Shaw, 1996).

When using adaptive equipment, teams should understand the following principles to ensure appropriate use of the equipment:

1. Well-selected and well-fitted equipment can only support postural control and maintain body alignment, not normalize tone or provide corrective forces.
2. Adaptive equipment maintains body alignment only when it fits appropriately and when the student is properly positioned in it.
3. Adaptive equipment may not produce the specific results desired for each student, so teachers, parents, and therapists must carefully observe the student using the equipment over time and in a variety of situations to determine whether the desired function is being achieved.
4. Because many students with motor disabilities may lack the postural control necessary to adjust their body position, the length of time that students use any single piece of equipment will vary on an individual basis.
5. Limiting students to one position (even when using equipment that fits well and is otherwise comfortable) can produce secondary problems, such as poor circulation or skin ulcerations, or secondary motor disabilities, such as muscle tightness or contractures that can lead to permanent deformity.

Teams should discuss the length of time that individual students should use various pieces of equipment. Some students can stand or sit comfortably for long periods of time (two to three hours or more). Other students require repositioning more frequently (every 30 minutes to 1 hour).

### Mobility

Mobility allows students to move from one place to another. Students with motor disabilities often require equipment to support their movement about their environment. When selecting equipment to support mobility, teams must consider the amount of time it takes for the student to get from one location to another and the energy expended. Because mobility equipment enhances the ability of students to move and socialize, teams should use caution when using equipment that results in the isolation of an infant or child from peers. Several mobility aids are available to promote



**FIGURE 9-21**

Kaye Reverse Posture Walker



Photos: Maria Jones

**FIGURE 9-22**

TiLite Aero T Manual Wheelchair with ROHO Seat Cushion



students' independence. These include canes, crutches, walkers (Figure 9-21), as well as power ride-on toys, manual wheelchairs (Figure 9-22 & 9-23), and power wheelchairs (Figure 9-24). Students may use a combination of mobility aids depending on environmental demands. Physical therapists and occupational therapists have an important role in determining the type of mobility aids students need to be as independent and functional as possible.

*Teo uses a four-wheeled walker to walk within classrooms and his home and then he uses a manual wheelchair in the school hallways, when outdoors, or in the community.*

**FIGURE 9-23**

Quickie IRIS Tilt-in-Space Manual Wheelchair



Photos: Maria Jones

**FIGURE 9-24**

Permobil C300 Power Wheelchair



### Communication

Students with motor disabilities often have accompanying limitations in communication that prevent verbal speech. To overcome these limitations, augmentative and alternative communication (AAC) is often recommended as a means other than speech to assist students in communication (see Chapter 12). We all use different strategies to augment our messages with facial expressions and gestures, or by pointing to visual supports in the environment in an effort to make sure our message is understood, but for students with motor disabilities, such strategies may be their only form of communication.

Making decisions about AAC for any student requires a team that is often comprised of the child, family, and professionals from two or three disciplines (Gierach, 2009). Each member of the team provides important information to the process allowing for a better decision. For example, the child identifies his or her abilities, limitations, needs, and desires. Family members provide information about any pertinent medical and educational history; day-to-day communication needs; family dynamics, strengths, and needs; family resources; and environmental considerations. Educators discuss current and projected educational abilities, learning needs and potential, and use of materials in the classroom. Speech-language pathologists discuss current receptive and expressive communication abilities, current and future communication abilities, needs, opportunities, and barriers and provide communication intervention. When students who use AAC, or may potentially use AAC, also have motor disabilities, physical therapists or occupational therapists contribute by (1) assessing motor control, (2) identifying body part(s) and movement(s) that the child may use to control AAC devices, (3) assessing positioning and ensuring that positioning systems promote optimal motor control and use of devices, (4) designing a system that best matches the motor abilities of the child, and (5) designing intervention strategies to promote functional use of the AAC system (McEwen, 1997).

### Adaptive Equipment/Assistive Technology

Physical therapists and occupational therapists are often involved in identifying and recommending appropriate equipment/technology for students to use. Figure 9–25 provides a list of important considerations that should be taken into account by the team. The purpose of equipment is often tied to the activity for which the student will use it. For example, a bath seat will get wet repetitively and is designed to provide support even when used in water.

*Sophie requires support to sit, so she will need equipment to support her trunk and hips while sitting for bathing, toileting, eating, and during classroom and home activities. Although we might be able to select a single piece of equipment to support her in sitting, some routines require equipment with special functions or features.*

Many students with motor disabilities will require equipment throughout their lives; although, some may only require it temporarily. For those whose needs are permanent, ease of use, durability, and adjustability become crucial to ensure the equipment will last for several years and can be adjusted and modified as the students grow or as their abilities change. Most insurance companies and third-party payment sources expect equipment to last a minimum of five years before they will consider

**FIGURE 9–25**

Important Considerations When Recommending and Ordering Equipment

- 1) purpose of equipment related to function
- 2) ease of use of equipment
- 3) durability of equipment
- 4) adjustability of equipment for growth or changing condition
- 5) environments in which equipment will be used

replacement, unless the child has a change in medical status. Because young students with motor disabilities grow rapidly just as their peers do, therapists should consider low-cost alternatives that can be easily replaced. “Homemade” seat inserts can be used to provide support as a child grows and needs change. Using a seat insert fabricated from Tri-wall packaging (i.e., cardboard used for an appliance carton that is three layers thick) and glue and covered with washable contact paper can be built and provide additional support in a chair. A wedge of upholstery foam can be cut to support and position an infant in alignment in a high chair. These options offer alternatives to ordering a specialized high chair or booster chair for mealtimes and would be appropriate based on the size and needs of the child. As an infant grows and transitions into preschool, a more customized seating support may be needed for sitting at the table during snack time. Because students will often use equipment across environments, therapists must consider the needs of all environments or settings in which the student participates on a regular basis when making recommendations. Different options may be available to appropriately position a student, but only one system may be suited to a school environment, be transportable in the family’s car or van, and support the child’s participation in family routines and in other settings where a family spends time. Determining that a recommended piece of equipment won’t fit in the bathroom of the school or in the family car after it is purchased is a waste of limited resources available to the student and often results in the unnecessary purchase of similar equipment for different environments. Many pieces of equipment are quite costly, and their purchase may not be fully covered by insurance or other health care programs. Therapists and school teams must consider environmental factors before recommending and ordering equipment.

Students with severe motor disabilities may receive equipment through a number of sources. Physical therapists and occupational therapists who work with the students in school settings should be involved in suggesting particular pieces of equipment and with securing and fitting equipment. Alternately, students may be referred by a physician or a therapist to specialized seating clinics that are operated by hospitals, rehabilitation centers, or state agencies to recommend equipment. In other instances, families, therapists, or teachers may purchase equipment directly after reviewing product information in catalogs. Equipment paid for through insurance, medical health care plans, or federal medical programs (such as Medicaid) often requires a physician’s prescription.

Equipment vendors assist families and professionals to secure the appropriate prescription and complete the necessary paperwork correctly. Most equipment used by students with severe motor disabilities requires adaptation and modification. Parents may experiment with adaptations or may return to clinics or local vendors to fit and adjust equipment, but physical therapists and occupational therapists are most often involved with the fitting and adjustment of equipment used for positioning and/or mobility. Following up is important when the equipment does not adequately hold the desired position or when the body seems to be misaligned. Family, teachers, and other adults responsible for the care of a student should not hesitate to contact the professionals who have been involved with ordering equipment. Figure 9–26 offers valuable suggestions for considering equipment options for a student.

The use of poorly fitting adaptive equipment may result in secondary motor disabilities, such as changes in muscle length or development of skeletal deformities. When equipment does not fit appropriately—whether too big or too small—maintaining proper alignment of the trunk or extremities becomes challenging. Improper alignment may be uncomfortable and make it more difficult for students to participate in typical daily routines and engage in learning at school. The most common secondary deformities caused by equipment that does not support the trunk and hips in sitting are those that involve the spine. Improper positioning may contribute to scoliosis (e.g., a “C” curve in the spine), kyphosis (i.e., a rounding of the shoulders), or lordosis (i.e., positioning of the pelvis in a tipped-forward position with a sway back).



**FIGURE 9-26****Suggested Activities to Guide Teams in Securing Appropriate Equipment**

At the beginning of each school year, work with therapists to assess whether each student's adaptive equipment is appropriate for the student and is used properly. To determine this, the team should decide on the following:

- Does the equipment fit the student?
- Do the staff members position the student properly in the equipment?
- Has the equipment produced the desired function over time and across activities?
- How long should the student remain in the piece of equipment before being repositioned?
- Is the equipment appropriate for the student's chronological age?
- Does the equipment allow the student to participate in activities in the same manner as peers?
- Does the equipment isolate or prevent the student from participating in an activity because of its size, height, or purpose?

Observe the students' typical activities during their school day (e.g., arrival and departure on a bus, movement to and from scheduled activities in other locations, use of the restroom, change of diapers, change of clothing for physical education class, or use of the library). For students who require assistance with their movements or communication, check to see if the following four activities occur during these routines:

- 1 The adult or peer makes physical contact with the student.
- 2 The adult or peer prepares the student for what is going to happen by communicating in a way the student can understand.
- 3 The adult or peer prepares the student physically for the routine.
- 4 The adult or peer performs the steps of the routine in ways that allow the student to have choices and requires the student to perform as much of the routine as possible.

### Use of Other Technologies and Equipment in the Classroom

Students with motor impairments may use other types of technology, including but not limited to switch interface devices, computers, communication aids, writing devices, adapted feeding equipment, or environmental control units to participate in specific activities. Most assistive technology devices are designed as an alternate means of performing a functional task. Power wheelchairs, augmentative and alternative communication devices, learning and communication apps, environmental control units, tablets and computers are examples of devices that use advanced technology to enable people with motor disabilities to participate in many different settings. High-tech electronic devices are often not easily used without training, instruction, or practice in their use. In other words, students do not just begin "talking" because we put a voice-output communication device in front of them. Low-tech devices (or adaptations) are as important as complex high-tech devices, and they may be easier for a student to use, less expensive, and more useful across settings and activities. A power wheelchair, for example, is useful in many settings but will not fit onto an airplane or in many cars. Because of the limitations of high-tech devices, most individuals need a combination of high- and low-tech devices to participate in activities and routines across environments.

*Sophie uses a variety of communication aids, such as high-contrast pictures and a single-switch device, when on a class trip to the zoo. Sophie also uses a switch interface on the computer that allows her to advance pages of electronic books and make choices about other activities. During the afternoons, she tends to fall forward a lot in sitting, so when she is doing a painting activity, her teacher positions her in a stander to paint at an easel positioned in front of her.*

Teachers and other professionals who work with students with severe motor disabilities often have difficulty including opportunities for practice with motor skills and using a variety of equipment to support movement during the school day. One commercially available curriculum designed to promote movement and functional



**FIGURE 9–27****Six-Step Process of the MOVE Program**

The MOVE Program is designed to use a six-step process to help the learners (*term used by MOVE to describe a student*) or family and/or care providers in helping the learner advance in their gross motor skills.

- Step One determines the learner's present skill level through an interview assessment.
- Step Two uses the learner's MOVE team (including the learner, family, care providers, and professional staff) to determine the functional goals needed to work toward promoting independence.
- Step Three creates meaningful, functional activities and embeds appropriate skills into the activity for the learners to be successful in reaching their goals.
- Step Four looks at the supports the learner currently needs.
- Step Five reduces the prompts the learner currently needs.
- Step Six defines and schedules teaching of the skills throughout the learner's typical day.

*NOTE: When the learner presents with a medical diagnosis that requires restriction of time spent in sitting, standing or walking, use of partial participation or the option to refrain from participation may be necessary to avoid damage or harm.*

motor skills is the MOVE (Mobility Opportunities via Education/Experience) Curriculum ([www.move-international.org/](http://www.move-international.org/)) described in Figure 9–27. Based on a philosophy of promoting function and improving quality of life in individuals with even the most severe physical impairments, teachers and therapists use the curriculum to teach and promote independence through the development of basic motor skills such as sitting, standing, and walking. By including principles of basic body mechanics with instructional processes to assist students in achieving greater levels of independence with motor skills, the curriculum has been used in over 20 countries.

### Transportation

Transportation is an integral part of the school services for many students with motor disabilities. Transportation is included as a related service that must be provided by school districts when an IEP team determines that a student with motor disabilities needs this support to access his or her education at school. IDEA (P.L. 108-446) does not provide specific guidance about transportation requirements, and although schools have to comply with IDEA, they must also consider Section 504 of the Rehabilitation Act (P.L. 93-112), the Americans with Disabilities Act (P.L. 101-336), and the federal Motor Vehicle Safety Standards and Regulations (Lake, 2005) when determining students' transportation needs.

Buses are the primary mode of school transportation. Students with motor disabilities may require assistance getting on and off the bus, as well as maintaining a seated position as the bus moves. Although bus seats are designed to provide protection during transport, young students, or any child weighing less than 50 pounds, are required to wear an appropriate child restraint or safety vest as shown in Figure 9–28.

Although safety requirements for securing wheelchairs and wheelchair occupants on school buses exist, students who use wheelchairs as their primary means of mobility should be transferred out of the wheelchair and positioned on a bus seat or car seat that meets safety standards whenever possible. Considerations around the feasibility of transfers include how much assistance the student requires, and whether or not the student can maintain a sitting position without wheelchair supports. If a student has to remain positioned in the wheelchair, safe transportation requires the use of a four-point wheelchair securement system to anchor the wheelchair to the bus/vehicle, and a separate occupant restraint to securing the student to the wheelchair. Occupant restraints are not part of the student's wheelchair, but are separate three-point harnesses that attach to the frame of the bus and positioned around the student. Postural supports used for

**FIGURE 9–28**

(a) E-Z On Vest (back view) and (b) E\_Z On Vest (side view)



(a)



(b)

Photos: Maria Jones

positioning in a student's wheelchair are not intended, designed, or tested as occupant restraints approved for transportation. These postural supports should never be used to replace the occupant restraint attached to the bus/vehicle.

Many newer wheelchair models are designed with transit options and come equipped with specific attachment points for securing the wheelchair during transportation. Older wheelchair and some contemporary models do not have transit options, so team members must anchor securement straps to the frame of the chair and should avoid securing them to any moving part of the wheelchair, such as the wheels, armrests, or footrests.

### Safety

To ensure safety of all students during transportation, effective communication between schools and transportation providers is essential, including communication about transportation needs and potential problems. School districts are responsible for ensuring that school bus drivers or other transportation providers understand (1) the special needs of individual students with motor disabilities who ride on school buses; and, (2) possible strategies and assistance that may be available, including use of aides and equipment on and off the bus. In addition, the IEP team must develop a plan that outlines the supports and equipment required by the student, including how to address any medical, physical, or behavioral concerns and how to safely secure all equipment during transport. Education and transportation staff may request assistance from other professionals, including occupational therapists, physical therapists, durable medical equipment providers, and other specialists to assist in the complex and potentially life-saving decision-making process for each student who will be transported to and from school each day.

## LEARNING OUTCOME SUMMARIES

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### 9.01 Impact on Education and Participation

#### Learning Outcome

*Understand the impact of motor disabilities on participation of students in school and on learning.*

Students with motor disabilities often experience barriers to participation with peers in typical school classrooms, activities, and routines due to limitations with posture, movement, communication, and self-care. Educating these students requires identifying how they can participate in their roles as students and as classroom/school peers and then designing specialized instruction to facilitate their participation to the greatest extent possible.

### 9.02 Team Support for Students

#### Learning Outcome

*Comprehend the role of the IEP team and related service providers in supporting students with motor abilities and their participation in school.*

The IEP team, including families, teachers, and related service providers, collaborates to support and enhance the students' ability to benefit from their education. Physical therapists and occupational therapists contribute their specific knowledge and expertise as part of the IEP team to facilitate student participation in meaningful activities. Building a strong and collaborative team is critical for developing goals, providing services, designing physical management routines, and selecting assistive technology that will meet the students' needs over time and across environments.

### 9.03 Meeting Students' Needs

#### Learning Outcome

*Describe strategies for meeting the physical assistance and management needs of students with motor disabilities in daily routines and school-related activities.*

Educating students with motor disabilities includes instruction in both academic and functional skills organized through their daily school activities. Using physical management routines that promote student participation in the classroom and other school environments, while also embedding skill practice, is an important strategy that requires collaboration, planning, and ongoing monitoring. A quality education program for students with motor disabilities addresses important functional skills that will promote the students' independence and participation in their community both as youth and adults.

## SUGGESTED ACTIVITIES

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1. Create a chart using the ICF framework that represents one area of participation that is restricted, limited, or otherwise significantly challenging for a student with motor disabilities.
2. Use the chart developed in #1 above to write an appropriate IEP goal for this student.
3. Write a paragraph that describes how the ICF framework and the GMFCS are similar and can both be used to help portray the functional capacity of a student with cerebral palsy.
4. Read the description of Sophie and Teo at the beginning of the chapter. What other equipment do you think might be helpful to assist each of them in learning with their peers? Explain what the equipment is and why you selected it.
5. Read the description of Sophie and Teo at the beginning of the chapter. What other equipment do you think might be helpful to assist each of them in a self-care activity that they perform during the school day? Explain what the equipment is and why you selected it.
6. Describe the team composition for Sophie and for Teo. Explain what expertise each team member can bring to an IEP meeting about each student's performance and goals.