

SUPPORTING THE EDUCATIONAL NEEDS OF STUDENTS WITH ORTHOPEDIC IMPAIRMENTS

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ABSTRACT

Students with orthopedic impairments have unique educational needs that require teachers to have specialized knowledge and skills in order to appropriately meet these students' needs. Current data suggest that teachers who are responsible for students with orthopedic impairments are often lacking in these proficiencies. Essential skills such as utilizing specialized instructional strategies, making appropriate modifications, addressing physical and health management issues, using effective assessment strategies, providing disability-specific core curricula, and integrating student specific assistive technology into the educational curriculum are all critical skills required of teachers of students with orthopedic impairments. The importance of addressing this body of knowledge and skills in personnel preparation programs is discussed, as well as several methods of technical assistance.

Students with orthopedic impairments (also referred to physical/health disabilities) have unique educational needs that require teachers to have specialized knowledge and skills in order to provide an appropriate education in a safe, healthy environment (Council for Exceptional Children, 1998). The current trend of moving away from categorical programs to more generic ones, as well as subsequent changes in personnel preparation programs, does not lend itself to teachers receiving specific training in orthopedic impairments. Without appropriate training on the unique knowledge and skills

necessary to instruct students with orthopedic impairments, these students will not receive an appropriate education.

The effects of generic licensure (or certification) on the field of orthopedic impairments are only beginning to be studied. One national study (Heller, Fredrick, Dykes, Best, & Cohen, 1999) found that one-third of generically licensed special education teachers who were responsible for students with orthopedic impairments reported being not well trained on about 60% of the knowledge and skills identified as important for teachers of students with orthopedic impairments. This included such skills as seizure management, modifying reading for students who are nonverbal, assistive technology, and integrating health care plans into programming. This lack of training was further supported by data from special education directors, of whom only 11.4%–22.8% reported that their teachers were well trained in educating students with orthopedic impairments. However, 91.6% to 94.5% agreed or strongly agreed that special education teachers should be trained in characteristics and educational implications of teaching students with physical and health disabilities, instructional adaptations, and assistive technology. The study further showed that almost all of the teachers who had special education degrees with a concentration in orthopedic impairments (or physical disabilities) reported being well trained on all of the competencies.

With students with orthopedic impairments in general education classes, general education teachers also need to have a certain level of knowledge and skills to instruct these students. Stafford, Williams, & Heller (2001) questioned general education teachers about their level of competency with students with orthopedic impairments across areas of physical management, adaptive equipment, emergency and health care issues, modifications and adaptations, assistive technology and collaboration. This study found that 40% of the general education teachers rated their competency as below average or none on 12 of the 28 competencies, although over 50% of the general educators agreed that it was important for them to know 23 of the 28 skills. One conclusion from this is that special education teachers are not collaboratively working with general education teachers in these areas. If special education teachers lack the knowledge and skills in this area, they will be unable to assist the general education teachers. This is particularly detrimental for students with severe orthopedic impairments who have normal or near normal intelligence and are working toward a regular high school diploma since appropriate modification and strategies may not be utilized.

When states move from categorical to a more generic form of licensure (or certification), university programs must adapt their curriculum. Universities that once provided courses specifically addressing specialized

knowledge and skills in orthopedic impairments are terminating these courses to offer more generalized training in order to meet their state's licensure (or certification) requirements. In the Heller, Fredrick, Dykes, Best, & Cohen (1999), over 40% of professors in generic special education programs reported that their students were not well trained in about one third of the competencies in orthopedic impairments. If this current trend continues, a crisis in the education of students with orthopedic impairments will escalate due to teachers receiving insufficient knowledge and skills, and a lack of faculty performing research in the area of orthopedic impairments (due to fewer graduates of doctoral programs in this field and faculty being moved over to other areas.) This decline in competency occurs despite the fact that the number of students identified as having orthopedic impairments is remaining approximately the same.

In light of this growing trend of providing less specialized information to special education teachers, there is often confusion regarding the field of orthopedic impairments. It is not uncommon to find special education teachers, special education directors, and university faculty unfamiliar with the field of orthopedic impairments and the unique knowledge and skills necessary for teachers to have to appropriately address this population of students. This article provides information on orthopedic impairments and the unique knowledge and skills required to provide these students with an appropriate education. Information on current practice is provided, as well as some training and technical assistance models that can be used to help provide teachers with the necessary training in this area. The material in this article may be used to influence district and state certification officers, legislators, and federal education personnel to develop and maintain certification in the area of orthopedic impairments. If this is not feasible, this article may also be used to promote specialized and appropriate training of teachers in the field of orthopedic impairments in order to provide these students with appropriate educational services.

ORTHOPEDIC IMPAIRMENTS DEFINED

The federal law is very clear in defining orthopedic impairment as a severe orthopedic impairment that adversely affects a child's educational performance (34.C.F.R.300 (a) Public Law 105-17). Students may have physical impairments, such as a missing leg, but if these impairments do not interfere with the students' school performance, they are not eligible for special education. Students whose physical disability does not impact their educational performance do not qualify for the special education category of orthopedic impairments.

Students who are eligible for special education under the term orthopedic impairments comprise one of the most diverse disability categories. They may have neuromotor impairments (e.g., cerebral palsy, spina bifida, spinal cord injuries), degenerative diseases (e.g., muscular dystrophy, spinal muscular atrophy), or musculoskeletal disorders (e.g., limb deficiencies, arthrogryposis) (Heller, Alberto, Forney, & Schwartzman, 1996). Students with orthopedic impairments may have additional disabilities, such as visual impairments or seizures disorders. Students who are classified as having an orthopedic impairment range from having gifted intelligence to profound mental retardation. These students may be on an academic curriculum track and go on to college, or they may be learning a functional curriculum with an aim to work in supported employment. Although this category of special education students contains a wide variation of students, these students share some common disability characteristics that can negatively impact school performance.

IMPACT OF ORTHOPEDIC IMPAIRMENTS ON EDUCATIONAL PERFORMANCE

The educational performance of students who have orthopedic impairments can be negatively affected due to several different compounding factors: a) type of orthopedic impairment, b) functional limitations resulting from the orthopedic impairment, and c) psychosocial and environmental factors. How an individual student will be affected depends upon the type of impairment and which functional, behavioral, and environmental factors are present. Once identified, appropriate intervention can occur. As seen in Figure 1, a cube model can be used to show the interactive affects among the three major categories.

Disability type. The type of orthopedic impairment and its severity can affect school performance. Students with neuromotor impairments, such as severe cerebral palsy, tend to have more involved motor, communication, cognitive, and health problems than students with musculoskeletal abnormalities, such as a missing arm. Students with degenerative diseases, such as muscular dystrophy, will have additional issues such as deteriorating function and death concerns (Best, 2001). Other impairments may also be present and complicate the ability to learn. For example, visual problems are estimated to occur in 50% of individuals with cerebral palsy (Dzienkowski, Smith, Dillow, & Yucha, 1996). Also, individuals with cerebral palsy have increased instances of epilepsy (15% to 55%) with concomitant decreased cognitive functioning (Crothers & Paine, 1988; Wallace, 2001).

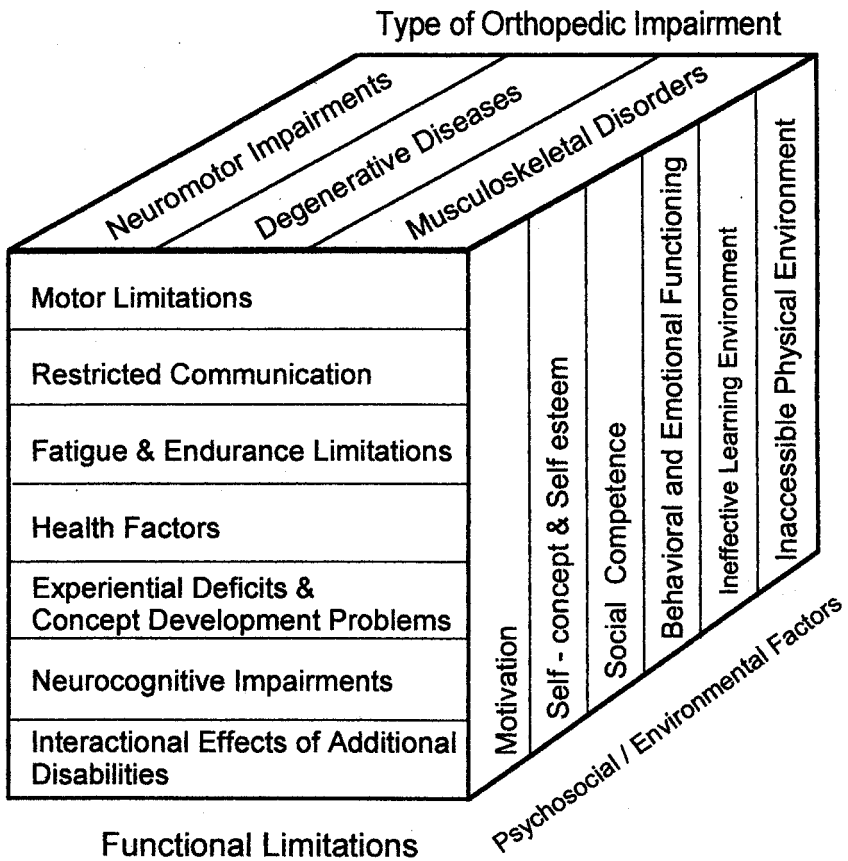


Figure 1

A model depicting the impact of orthopedic impairments on educational performance

Functional limitations. Depending upon the type of orthopedic impairment, the student may have one or several functional limitations that can affect school performance: a) motor limitations, b) restricted communication, c) fatigue and endurance limitations, d) health factors, e) experiential deficits and concept development problems, f) neurocognitive impairments, and g) interactional effects of additional disabilities.

By definition, students with orthopedic impairments have disorders that affect their motor movements. When motor problems affect arms and hands, the student may have difficulty manipulating standard classroom equipment (e.g., writing tool, keyboard, books, protractor, microscope, dissection equip-

ment) or performing daily tasks (e.g., eating lunch, taking off a coat, moving from one location to another, using a restroom). Although assistive technology may help in providing access to materials and tasks, some students are inconsistent or very slow in using their devices. For example, a student may learn to use an alternate input device for a computer, but only be able to type three words a minute. This would negatively impact the ability to write and properly revise classroom papers while keeping up with other schoolwork.

Some students with orthopedic impairments will have restricted communication due to such conditions as severe quadriplegic cerebral palsy that often result in severe dysarthria or apraxia (Solot, 1998). These students will be unable to talk about activities or events with other individuals, hence they will miss opportunities to convey ideas and ask questions. Not only does this negatively impact gaining new information, but can influence all academic areas. For example, literacy skills can be negatively affected by the inability to ask questions about sounds, words, stories, or ideas. This results in unanswered questions, ineffective learning, and interference with literacy development (Blischak, 1995; Katims, 1993). Students who do not have understandable speech use augmentative communication to communicate, such as dedicated communication devices. However, as students are learning to use their particular form of augmentative communication, they will be limited in what they will be able to ask or discuss. Even when students have learned how to use their augmentative communication device, they will not have sufficient vocabulary to ask questions, comment on material, or ask for clarification on a range of topics, unless the students have the necessary literacy skills to spell out specific messages. While students are learning to spell out messages, questions go unanswered, misunderstanding regarding school material occur, and often this is accompanied by a decrease in classroom participation.

Many students with orthopedic impairments experience fatigue and endurance problems due to the effort it takes to move. Also, fatigue and endurance may occur as a side effect from medications (e.g., seizure medications). These problems can minimize attention to the school task and can interfere with learning the material.

There are often various health factors associated with orthopedic conditions that can limit and interfere with school performance. These health factors affect how well the student feels which in turn can impact the extent to which a student can attend to instruction or carry out assignments. For example, some students may experience pain or discomfort, such as students who have juvenile rheumatoid arthritis. Other students may feel sick and be unable to fully participate in classroom activities. Students with orthopedic

impairments often have high rates of absenteeism due to surgeries, hospitalizations, and illness. In some instances, these students will need hospital/homebound instruction. The negative impact on learning when feeling ill or in pain is obvious. This may be compounded by medication side effects or medical treatments that result in further discomfort, fatigue, or inattention.

The fifth functional limitation is a lack of experiences and problems with concept development. Students with physical disabilities often lack common experiences due to difficulty ambulating and exploring interesting items or activities (Blischak, 1995). For example, some students may never see an ant since they are not typically sitting or exploring in the grass. Other students may miss the experience of going to certain locations (e.g., mall, movie) due to transportation issues at home. When students lack experiences, it can negatively impact comprehension of material. It may also result in lower achievement and IQ scores when questions are based on experiences that have never occurred. For example, one item on a standardized test asks how to remove a ring stuck on a finger and a student who has missing arms selected the picture showing pliers instead of the soap and water picture. On another test, one question asked the student to select a picture illustrating one way we talk to each other, and a student with cerebral palsy picked a calculator instead of a telephone because it looked like his augmentative communication device.

Neurocognitive functioning may be affected in students with orthopedic impairments. For example, students with spina bifida have an increased incidence of distractibility, disorganization, visual-motor deficits, fine-motor dysfunction, restlessness, visual abnormalities, language impairment (e.g., cocktail party syndrome), and learning disabilities, as well as particularly low mathematics achievement (French, 1995; Hunt, 1981; Lennerstrand & Gallo, 1990; Williamson, 1987). It is not unusual for students with orthopedic impairments to have additional cognitive, perceptual, and learning disabilities. In some impairments, such as cerebral palsy, there is an increased incidence of mental retardation and learning disabilities, although some individuals will still have normal to gifted intellectual abilities (Whaley & Wong, 1995).

When an intellectual disability exists, it is not necessarily the sole factor influencing school performance when a physical disability is also present. Students with severe physical disabilities have been found to have reading skills that are poorer than would be predicted based on intelligence and educational levels (Foley, 1993; Seidel, Chadwick, & Rutter, 1975) and often these difficulties continue into adulthood (Smith, 1989). This may be attrib-

uted to limited expressive and receptive vocabulary, limited phonological abilities, as well as problems of rehearsal in working memory (Blischak, 1994; Sandberg, 2001).

Some students with orthopedic impairments have additional impairments such as blindness, deafness, severe health impairments, emotional disturbance, or mental retardation. The impact of these additional disabilities often will result in an interactional, multiplicative effect rather than a simple, additive effect. For example, a student with severe spastic cerebral palsy who is blind will be unable to tactually or visually explore his environment resulting in significant deficits and delays in concept development.

Psychosocial and environmental factors. In addition to the specific type of orthopedic impairment and the resulting functional limitations that can affect school performance, there are also psychosocial and environmental factors that may significantly impact the student's performance. Children with certain physical disorders (e.g., rheumatoid arthritis, cerebral palsy) have been shown to be at risk for mild to severe problems in psychosocial adjustment, with the risk increasing when students have serious or life-threatening conditions (Lavigne & Faier-Routman, 1992; Schuman & La Greca, 1999). Various psychosocial and environmental factors comprise the last category of the cube model: a) motivation, b) self-concept and self-esteem, c) social competence, d) behavioral and emotional functioning, e) ineffective learning environment, and f) inaccessible physical environment. (See Figure 1). The impact of each of these can greatly vary depending upon the individual student.

The extent to which a student is motivated to succeed in the school environment will affect school performance. Motivation is influenced by internal factors (e.g., self-efficacy, external locus of control). Self-efficacy describes children's confidence in their abilities to perform certain activities or achieve certain goals (Bandura, 1977; 1982). When poor self-efficacy is present, motivation to perform certain tasks will be decreased (Lemanek & Hood, 1999). Motivation is also linked to how individuals perceive and explain events, also referred to as attribution. One type of attribution is locus of control, in which students perceive events as occurring internally "I did it" or externally "someone else did it." Students with a primarily external locus of control attribute successes and failures to external forces or someone else, not to their own abilities or actions. External locus of control can negatively affect the motivation to succeed (Lefcourt, 1976; Tomlison, 1987).

There are also external factors that can influence motivation: a) how others react to the student (e.g., "you aren't capable of doing this"), b) competing priorities (e.g., a student with muscular dystrophy being more con-

cerned over dying than studying for a math test), or c) development of learned helplessness. Learned helplessness is the lack of persistence at tasks that can be mastered (Marks, 1998). Students who have learned helplessness are capable of performing certain tasks, but due to repeated instances of other individuals performing the task for them, these students learn to wait for the task to be done for them. Thus, a student may passively wait for someone to feed him or open a door, even though this skill could be learned.

The second psychosocial factor that can affect school performance is self-concept and self-esteem. Students with an orthopedic impairment realize as early as preschool that they are different than others and many know the name of their condition with at least one of its effects by age 3 or 4 (Dunn, McCartan, & Fuqua, 1988). How children with orthopedic impairments come to view themselves and their abilities can impact how well they perform in school. Students' reactions to their disability may result in feelings of isolation or unhappiness (Rydstrom, Englund, & Sandman, 1999). Poor self-concept and poor self-esteem have also been linked to depression (Kazdin, 1988) and some studies have reported lower self-esteem in children with cerebral palsy (Magill-Evans & Restall, 1991; Teplin, Howard, & O'Connor, 1981).

Social competence can play a major role in how students feel about themselves which influences how they perform in the school setting. Poor social competence in children without disabilities has been associated with a greater prevalence of psychiatric problems and poor adjustment to school demands (Cicchetti, Toth, & Bush, 1988). This is thought to apply to children with disabilities as well. Children with physical disabilities and chronic illness have been found to have more peer social difficulties than children without impairments or children with only chronic illness (Cadman, Boyle, Szatmari, & Offord, 1987; Schuman & La Greca, 1999). The importance of developing social competence, as well as gaining social supports, can not be minimized. They have been identified as two major coping strategies to handle problematic situations or events (Lazarus & Folkman, 1984) and have been found to be a significant factor in predicting overall life quality (Best, 1999).

The fourth psychosocial and environmental factor is behavioral and emotional functioning. How students adapt or cope with their disability will impact behavioral and emotional functioning. Some children may show resilience when a significant physical deterioration is present, while others may have significant behavioral and psychological problems when minor disease is present (Best, 1999). Some students will evidence anger, depression, hopelessness, manipulation, or severe emotional problems (Heller, Alberto,

Forney & Schwartzman, 1996). Although many students are well adjusted, when emotional problems exist, school performance typically decreases. Students with orthopedic impairments must develop certain positive behaviors, such as self-advocacy, in order to fully succeed in the school environment. Self-advocacy is the student's willingness to inform others of his or her needs in order to effect change. If a student with an orthopedic impairment needs to have the material repositioned in order to see it, the student needs to inform the teacher of the need. Unless the student speaks up, the need may go unnoticed and the student will miss seeing the material that is needed for the lesson.

An ineffective learning environment can directly affect students' performance in school. Although this is the case for any student, students with orthopedic impairments may experience an ineffective learning environment due to the contextual and social dimensions of their physical disability. Contextual dimensions of disability are specific situations or activities that create problems of participation and often need adaptation in order to be accessible (Kirshbaum, 2000). If teachers do not provide the appropriate adaptations, then performance will be affected. Social dimensions of disability are social obstacles such as exclusion, stereotypes, social stigmatization, negative assumptions about and teaching down to those with physical disabilities (Kirshbaum, 2000). An environment in which negative assumptions about student abilities occurs will not only affect student performance, but can result in an inappropriate curriculum.

Students with orthopedic impairments experience an inaccessible physical environment due to the environmental dimensions of their physical disabilities (Kirshbaum, 2000). These dimensions are barriers in the environment that preclude access to students with disabilities. Although most school environments are accessible due to changes in federal law, there are many activities associated with the school that may not be completely accessible (such as going to the creek to collect biology samples, or going on certain field trips.) Being excluded from certain activities may affect learning and hence, school performance.

TEACHER KNOWLEDGE AND SKILLS

In order to meet these students needs, a team of individuals is necessary. The team composition varies, but often consists of the special education teacher, general education teacher(s), occupational therapist, physical therapist, speech language pathologist (SLP), parents, student, nurse, and others.

Special education teachers who are licensed to teach students with orthopedic impairments need to have specialized knowledge and skills spe-

cific to the population of students that they are serving. This applies to special education teachers who have a more generic licensure (or certification), as well as those with a more categorical one. Upon obtaining these knowledge and skills, special education teachers need to share their expertise with students' general education teachers (and team) in order to promote effective inclusion. CEC's International Standards for the Preparation and Licensure of Special Education Teachers (The Council for Exceptional Children, 1998) includes a section on Knowledge and Skills for Beginning Teachers in Physical/Health Disabilities. The majority of these knowledge and skill areas can be arranged into six major disability-specific categories: a) physical and health monitoring and maintaining a safe, healthy environment, b) adapted and specialized assessment and evaluation, c) modifications and assistive technology, d) specialized instructional strategies, e) disability-specific core curricula, and f) setting the affective and learning environment.

Physical and health monitoring and maintaining a safe healthy environment. Teachers certified to teach students with orthopedic impairments should be knowledgeable about each student's specific orthopedic impairment. This includes knowing about the disorder's characteristics, course, treatments (including medication side effects), and restrictions (including diet and activity restrictions). Also, it is important for teachers to be knowledgeable about specific warning signs of problems and have the ability to provide appropriate intervention should a problem occur.

Special education teachers must also understand how the disability can impact the students' educational performance and the methods used to address any disability-specific problems affecting their performance. Teachers need to be alert for fatigue and endurance issues. They should arrange students' schedules to minimize these effects and know how best to address these issues when they occur. For example, some students with cerebral palsy may fatigue from repetitive motor movements such as using a switch to access a computer. When this occurs, teachers need to evaluate and utilize possible alternative switch placements or alternative modes of response. Other students may experience severe fatigue, such as those with advanced muscular dystrophy. In these situations, teachers should be able to recognize the problem and provide appropriate modification, such as a rest break, position change, use of assistive technology to decrease motor responses, or change of activity.

All teachers need to maintain a safe, healthy environment for their students with orthopedic impairments (DPHD Critical Issues and Leadership Committee, 1999). Not only does that include being knowledgeable about the students' disabilities, but they must actively monitor for specific prob-

lems, such as seizures, shunt malfunction, and changes in degenerative diseases. Being knowledgeable about the potential problems and the appropriate interventions for these problems can minimize injury to students. IHPs (individualized health care plans) can help school personnel know what steps to follow should problems arise (e.g., what to do if a gastrostomy tube becomes dislodged), as well as provide important information regarding health needs (e.g., need for frequent hydration) (Heller, Forney, Alberto, Schwartzman & Goeckel, 2000; Rueve, Robinson, Worthington, & Gargiulo, 2000).

Other health problems and emergency situations can arise involving students with orthopedic impairments. Special education teachers responsible for these students should know how to evaluate the evacuation procedures (e.g., fire drill, bomb drill) for students with mobility impairments from different locations in the school. First aid and CPR can especially be important for these students who are more likely to have falls resulting in injuries (e.g., seizures resulting in a fall to the floor, balance issues with an unsteady gait or walker, or brittle bones) as well as more complex health issues that may result in the need for CPR. It is also important for teachers to know universal precautions with all students. Students with orthopedic impairments often have difficulty with bodily fluids (e.g., drooling, inability to toilet train due to physical factors) requiring the implementation of certain universal precautions (e.g., cleaning environmental surfaces, glove use) that other teachers may not typically perform.

Adapted and specialized assessments. Students with orthopedic impairments require a knowledgeable teacher to assess and provide appropriate adaptations to tests and assessment instruments. For example, some assessment instruments will need the response choices moved to within the student's range of motion, as well as appropriately spaced so the student can point to the answer. In other cases time limits will need to be expanded. In these two examples, the special education teacher needs to be able to determine the most appropriate placement and how to assess and make changes should the student's motor ability change as the test is being administered. When students have restricted communication and movement, teachers must also determine the students' most reliable means of response to best assess student's knowledge of classroom instruction. For example, a student may be able to accurately eye gaze multiple choice answers far better than using an augmentative communication device to answer questions when he is still learning to use the device.

Teachers of students with orthopedic impairments also need to be able to collaboratively assess and implement interventions specifically relating to

motor and physical areas. For example, it is important that the teacher knows how to work with therapists to assess motor requirements for specific academic, performance, social and/or health maintenance tasks throughout the school day. These assessments would include areas that are impacted by lack of mobility, postural maintenance, hand function, bilateral skills, and other pertinent areas. Teachers should also be able to evaluate whether the student is positioned correctly with appropriate postural supports in order to stabilize seating and optimize motor performance in academic activities, including writing, graded grasp-reaching-volitional release, and interactions with electronic devices (e.g., communication devices and computers).

Special education teachers also need to perform other specialized assessments. Students with orthopedic impairments will often need assistive technology and teachers need to be able to assess students with orthopedic impairments and develop assistive technology plans. This includes performing discrepancy analysis to determine if student errors on academic or functional tasks are due to physical, cognitive, health, sensory, motivation or other means. Teachers must also know how to use results of specialized evaluations and make instructional decisions based on their results.

Modifications and assistive technology. In order to compensate for students' motor limitations, restricted communication, interactional effects of secondary disabilities, and/or problems with ineffective or inaccessible environments, teachers need to have the skills to assess, select, implement, and evaluate modifications (including assistive technology). This includes the use of modifications or assistive technology to promote the student's academic or functional curriculum.

Modifications range from providing more time to complete tasks to using a computer with alternate input for assignments. Although the type and extent of modifications greatly vary across students with orthopedic impairments, students often need alterations in one or several major categories: a) environmental arrangement modifications (e.g., scheduled rest breaks, preferential seating, materials specially positioned/stabilized); b) instructional modifications (e.g., study outlines, extra repetition, organization, extra set of books); c) modifications and assistive technology across specific content areas (e.g., on-screen keyboard with trackball for writing, talking calculator for math, environmental control unit for cooking activity, chemistry laboratory glassware modified with handles); d) class participation modifications (e.g., extra time to respond, alternate response mode, augmentative communication); e) modifications for assignments and tests (e.g., extended time, shorter test segments, alternate responding, computer use alternate input, alternate test format); and f) other modifications (e.g., assistance in moving

chair up to desk, use of mechanical feeding device, assistance with toileting, assistance with mobility). Teachers licensed to teach students with orthopedic impairments need to be able to assess, design, and implement these types of modifications and evaluate their successfulness. It is also important to have good teaming and collaboration skills to effectively work with other teachers and related service staff as modifications are selected and put in place.

Specialized instructional strategies. Special education teachers licensed to teach students with orthopedic impairments will need to be familiar with a range of instructional strategies to address students' experiential deficits and neurocognitive impairments, including the provision of additional experiences and correction of comprehension problems due to inaccurate concepts or lack of information. When students have motor limitations and severe speech impairments, additional specialized strategies are needed. For example, teachers need to know how to teach nonverbal students to phonetically decode words and read them correctly. Strategies such as the Nonverbal Reading Approach for Students with Physical Disabilities are designed to teach internal speech and assess whether students are reading the words correctly through the use of diagnostic distractor arrays (Heller, Fredrick, & Diggs, 1999). In another example, students using alternative writing modes, such as a switch and a software program that scans the alphabet along with word prediction software, may write very slowly. Teachers need to utilize instructional strategies that will teach appropriate writing and revision skills (including strategies to increase speed) while making adaptations to assure that the student learns the necessary material in a manageable time frame.

Students with orthopedic impairments often have additional impairments such as mental retardation, learning disabilities, perceptual problems, distractibility, disorganization, visual-motor deficits, restlessness, and visual abnormalities that can affect school performance. Teachers will need to be knowledgeable of the array of teaching strategies that are used to address these impairments and use them in combination with the adaptations and modifications needed to accommodate for the orthopedic impairment.

Disability-specific core curricula. In addition to knowing how to adapt and teach students' core academic curriculum or functional curriculum, the teacher of students with orthopedic impairments also needs to teach specialized disability-specific core curriculum areas that are pertinent for each individual student. Disability-specific core curricula address the unique, specialized needs of students with orthopedic impairments and includes, but is not limited to: assistive technology, augmentative communication, motor and compensatory skills, mobility skills, social skills, self-advocacy training,

independent living skills, vocational skills, leisure skills, and medical/health self-management. Each of these areas requires unique adaptations and training to meet the needs of students with orthopedic impairments.

Teaching disability-specific core curricula in the areas of assistive technology and augmentative communication goes beyond using these as a modification in the classroom. Typically students will learn programming, maintenance, and care of their devices. Students will also learn decision making skills to address problems that may occur with their devices, and who to contact for help should they be unable to fix the problem themselves. Students learn how to manage the device, not just use it.

In the area of medical/health self-management, students learn to be active participants in their own care. For example, a student may be taught to partially or completely tube feed himself/herself (or know the steps to direct someone else). Students also are taught about their medications and treatments. Students who use braces (or orthosis) or who are wheelchair users may be taught to inspect their skin for problems. Learning how to inspect and care for their medical and health equipment is also a part of disability-specific core curricula.

Setting the affective & learning environment. As with all students, a positive environment with high expectations that is responsive to each student's needs is important. When students have orthopedic impairments, teachers will need to consider psychosocial factors (e.g., motivation, self-concept & self-esteem) and behavioral or emotional issues. Teachers will need to identify and decrease learned helplessness, as well as talk to students about disability-specific issues (e.g., death and dying concerns). Knowing when a referral is necessary is equally important. Educating others to avoid the social dimension of disability (e.g., stereotypes, social stigmatization, negative assumptions) also falls into the realm of teacher responsibility.

CURRENT PRACTICE

Serious questions are raised regarding teachers' knowledge and skills in the field of orthopedic impairments. Although further studies are needed, the studies discussed in this article point to a serious lack of knowledge and skills in the area of orthopedic impairments in special education teachers with more generic licensures, as well as general education teachers. University programs providing more generic forms of licensure are tending to provide insufficient knowledge and skills in this area. To help correct this problem, personnel preparation programs should include the unique knowledge and skills necessary to appropriately educate students with orthopedic impairments, including the more difficult students with orthopedic impairments

who are nonverbal but have normal or near normal intelligence and are on an academic track.

To further address the problem of poorly trained special education teachers, CEC's Division for Physical and Health Disabilities issued a position statement in which states are urged to maintain or institute distinct and separate professional licensure or certification for physical/health disabilities as a professional certification category (Heller, 1997). This stand is based on the failure of teacher preparation programs for students in generic, noncategorical, or mild/severe tracks to address the specialized needs of students with orthopedic impairments in their programs. The unique body of knowledge and skills necessary to address students with orthopedic impairments is viewed as similar to those for teachers certified in visual or hearing impairments, and should be distinct to assure students with orthopedic impairments appropriate services by teachers who have the specialized knowledge and skills to meet their needs.

TRAINING & TECHNICAL ASSISTANCE

With state certification changing and teachers not always properly prepared to meet the educational needs of students with orthopedic impairments, teachers need a means of obtaining the vital skills necessary to appropriately educate these students. One way to do this is through the provision of technical assistance. Technical assistance does not replace the need for university programming or separate certification in orthopedic impairments, but is a way to support teachers and provide immediate assistance.

There are many forms of technical assistance that may be helpful in addressing this problem: a) consultation, b) training, c) model development and replication, d) product development and dissemination of information, f) meetings, and g) linkage to other agencies (Stremel, 1997). Each of these categories contains various types of technical assistance that may assist teachers in meeting the needs of students with orthopedic impairments.

Consultation may occur on-site or through phone conversations, on-line discussions, mentoring activities, or videotape review and feedback (Stremel, 1997). Unlike videotape review or on-line methods, on-site consultation has the advantage of having an expert in orthopedic impairments in the classroom and directly interacting with the student and the teacher. However this may not always be feasible so videotape review in conjunction with on-line or telephone consultation may be appropriate.

Another form of technical assistance includes group training, self-study, and train-the-trainer models. Providing inservice programs is one of the oldest and most widespread methods of providing technical assistance to

teachers (Anderson, 2000). Inservice programs range from small, team oriented programs to large multi-week summer programs and may occur in person or through distance learning. Although inservices directed towards a larger audience are more time efficient, often smaller specific inservices are needed to address the needs of each individual teacher and educational team. Providing on-site consultation after an inservice is a common approach used to bridge the information heard during the inservice and application of the information. Self study materials may be given in addition to inservice and consultation. If given by themselves, further training is often needed to be sure the principles are applied appropriately.

The train-the-trainer model, in which teachers are trained to serve as resources and mentors for other teachers, not only increases local capacity, but also provides more widespread base of support. These train-the-trainer programs allow for ongoing support. Teachers take ideas from mentor teachers, try them out, and then return to reflect, troubleshoot, and fine-tune the recommendations (Pennell, 1998). Train the trainer programs are similar in format to inservices. Teachers and other service providers are provided with the technical assistance and instruction in teaching skills to others. These teachers, in turn, pass along their knowledge to others. This type of technical assistance provides an efficient avenue for sharing skills among educators of low incidence populations (Schmidt, 2000).

Development and identification of model sites that demonstrate effective educational practices with students with orthopedic impairments is another useful technical assistance approach. Model sites provide classroom teachers the opportunity to observe the use of assistive technology, specialized teaching strategies, and the application of best practices. These sites may be developed through on-going technical assistance and then disseminated to other teachers as model sites.

Other forms of technical assistance such as product development and information dissemination, meetings, and linkages to other agencies and resources are also used. Information dissemination through brochures, websites, articles, face sheets and loaner libraries can be very useful. Meetings among teachers educating students with orthopedic impairments can promote sharing information and resources. Also, the provision of other related organizations or agencies could help make important linkages and obtain needed information.

One effective method of providing these various forms of technical assistance is through the establishment of a bureau. For example, the Georgia Bureau for Students with Physical and Health Impairments was established to assist school personnel in meeting the educational needs of students with

orthopedic impairments. The majority of technical assistance has been provided in: specialized reading strategies to promote literacy in students who are nonverbal (e.g., Nonverbal Reading Approach), promoting writing skills using modifications and assistive technology, augmentative communication use to support learning, and teaching students to self-perform health care procedures.

The Georgia Bureau for Students with Physical and Health Impairments is supported through a federally awarded State Improvement Grant to the Georgia State Department of Education. Statewide technical assistance is provided through on-site consultation (averaging 30 on-site visit year), inservice training (averaging 4 regional/statewide training and up to 6 local inservices a year), mentor teachers and model sites development (averaging 2 a year), and material development and dissemination through brochures, newsletters, monographs, consortium formation, and a website (<http://education.gsu.edu/physicaldis>). Evaluation data of this bureau show a high rate of implementation of recommendations and a high level of satisfaction. Other states may be able to replicate this model to promote the education and support of teachers who have students with orthopedic impairments.

A similar model to NTAC (The National Technical Assistance Consortium for Children and Young Adults Who are Deaf-Blind) in the field of orthopedic impairments may be possible. This federally supported grant provides technical assistance to families and agencies serving infants to young adults who are deaf-blind. NTAC interfaces with state projects for children and young adults who are deafblind, family organizations, state education agencies, adult agencies, and other state and local organizations. Through NTAC's training, consultation, regional meetings, dissemination efforts, and other forms of technical assistance, personnel are able to increase their knowledge and skills in the area of deaf-blindness.

In summary, students who have orthopedic impairments have unique educational needs that require teachers to have specialized knowledge and skills in order to adequately meet these students' needs. Current data suggest that special education teachers who are responsible for students with orthopedic impairments are often lacking these skills. The movement away from categorical special education programs and broad changes in personnel preparation programs have not resulted in positive outcomes. Based on the data thus far, these changes have resulted in poorly prepared teachers who do not have the necessary knowledge or skills to instruct students with orthopedic impairments or maintain a safe, healthy school environment. To help meet these students needs, state departments of education, universities, and school systems need to examine how to best provide these teachers with the

necessary information and technical assistance so that the educational needs of students with orthopedic impairments will be met appropriately.

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