

edited by

Mark L. Batshaw, M.D.

Children's National Medical Center
The George Washington University
School of Medicine and Health Sciences
Washington, D.C.

Louis Pellegrino, M.D.

SUNY Upstate Medical University
Syracuse, New York

Nancy J. Roizen, M.D.

Cleveland Clinic
Cleveland, Ohio

2007

· P A U L · H ·
BROOKES
PUBLISHING CO.®

Baltimore • London • Sydney

37 Physical Therapy and Occupational Therapy

Lisa A. Kurtz

Upon completion of this chapter, the reader will

- Appreciate the contribution made by occupational therapists and physical therapists in helping children with disabilities to achieve their potential
- Recognize when and how to recommend therapy services
- Become familiar with some common approaches to intervention, including motor learning theory, sensory integration therapy, orthotics, and nonmedical assistive technology

Children with disabilities may experience a wide range of impairments in body structure and function, limitations in their ability to participate meaningfully in activities of daily life, and restrictions in their ability to be an active part of their community (World Health Organization [WHO], 2001). Occupational therapy and physical therapy are commonly recommended to address these issues.

Physical therapists focus on evaluating the influence of motor development, along with the child's physical capacities and limitations, on the child's potential for functional mobility within the environment. Occupational therapists focus on evaluating the cognitive, motor, and sensory processing skills needed for independence in self-care, play, and school performance, which are the primary "occupations" of childhood. Although play is the medium of choice for most young children, therapy incorporates a variety of interventions including exercise, sensory stimulation, physical agents, splinting or casting, adaptive aids and equipment, and behavioral training, depending upon the needs of the individual child (American Occupational Therapy Association [AOTA], 2002; American Physical Therapy Association [APTA], 2001). Overlap in the roles of physical and occupational therapists exists for several reasons. Both professions require similar educational backgrounds in human development, anatomy and physiology, the scope and nature of disabili-

ties, and a general approach to habilitation (teaching skills that have not yet been learned) and rehabilitation (teaching skills that have been lost through illness or injury). Postgraduate continuing education allows therapists from both disciplines to develop advanced skills in selected interventions, such as splinting, application of assistive technology, and other specialized therapy approaches. The interests and talents of individual therapists, along with the philosophy and needs of the workplace, often dictate the exact nature of a therapist's role in that setting. Table 37.1 reviews some of the ways that occupational therapists and physical therapists might approach similar goals from different perspectives.

KIA: A CHILD WITH CEREBRAL PALSY

Kia was born prematurely and was diagnosed with periventricular leukomalacia (a cause of cerebral palsy; see Chapter 9) shortly after birth. Physical therapy intervention began in the neonatal intensive care unit in the form of consultation with parents and unit staff regarding positioning and handling techniques designed to help her develop postural control and the ability to maintain a quiet, alert state during her waking hours. By 6 months of age, Kia was actively engaged in her environment, playing with toys and interacting with people. However, the muscle tone in her legs

was increased compared with the tone in her arms, and she was unable to sit unsupported. A diagnosis of spastic diplegic cerebral palsy was made, and she was referred for early intervention services. Outpatient physical therapy focused on a home management program, bilateral foot orthoses, adaptive seating, and helping Kia learn to sit and crawl. By 3 years of age, Kia was able to walk with canes, and was enrolled in a preschool program where she began occupational therapy with an emphasis on learning dressing and other self-care skills. Although she had typical intellectual development and was not a candidate for special education services upon entering kindergarten, Kia was eligible to continue receiving consultative physical therapy and occupational therapy services under the provisions of Section 504 of the Rehabilitation Act of 1973 (PL 93-112).

At age 6, Kia underwent orthopedic surgery to lengthen her lower extremity muscles, followed by a period of intensive physical therapy to improve her hip and knee control. This allowed her to continue to be a community ambulator with the use of canes, although Kia preferred a manual wheelchair for extended trips. By third grade, Kia was falling behind in schoolwork due to handwriting difficulties, and the occupational therapist recommended classroom modifications that included instruction in word processing that allowed Kia to complete classroom assignments more efficiently.

Kia has continued her schooling, attending general education classes, receiving good grades, and participating fully in extracurricular activities that she enjoys. As she enters high school, she is considering a power scooter to improve speed

and freedom of mobility in her expanded school environment and in the community with her peers. She continues to be monitored by a physical therapist to address current or potential activity limitations.

CONTEMPORARY ISSUES IN PHYSICAL THERAPY AND OCCUPATIONAL THERAPY

Therapists practicing in the 21st century have witnessed many changes in the way that their services are conceptualized and delivered. In the past, the focus was on identifying and treating the deficits that limited a child's participation in activities. Using a bottom-up problem solving approach, goals and interventions were selected according to professional judgment as to the child's potential for remediation of these underlying deficits. Therapy most commonly occurred in a clinical setting where therapists could create a controlled environment for producing change. Current practice supports ability-based models of service delivery, in which goals and interventions are determined based on the priorities of the child and family, as well as on the environmental and cultural context of the child's participation in daily activities. Therapy frequently takes place in natural environmental settings, recognizing that this will likely result in increased caregiver carryover of therapy goals and increased generalization of learning. Official practice guidelines for both occupational therapists and physical therapists have recently undergone revision, using language and terminology consistent with WHO's International Classification of Functioning, Disability and

Table 37.1. Comparison of occupational therapy (OT) and physical therapy (PT)

Desired outcome	Typical OT emphasis	Typical PT emphasis
Promote developmental skills	Fine motor, adaptive, and personal-social domains	Gross motor domain
Teach functional skills needed for daily living	Dressing, eating, toileting, personal hygiene, and household chores	Ambulation, transfers, and other mobility demands
Maintain or increase strength and range of motion	Upper body	Lower body
Promote environmental accessibility	Organizing work and play areas for efficiency Modifying the environment to promote attention and information processing	Reducing architectural barriers to mobility Providing adapted car seats or transportation devices
Provide assistive technology	Adapted toys, school materials, computers, self-care aids, and environmental controls	Wheelchairs, ambulation aids, transfer equipment, and positioning devices for bath and toilet

her expanded school community with her monitored by a physician or potential activ-

PHYSICAL THERAPY

In the 21st century have in the way that their need and delivered. In identifying and treating a child's participation a bottom-up problem and interventions were professional judgment as remediation of these therapy most commonly setting where therapists environment for practice supports ability-delivery, in which goals determined based on the child family, as well as on cultural context of the child's activities. Therapy natural environmental setting this will likely result in a transfer of therapy goals to the child's learning. Occupational therapists have recently emphasized language and terminology WHO's International Classification of Disability and

Physical PT emphasis

Motor domain

Balance, transfers, and other demands

Activity

Architectural barriers to

Adapted car seats or transportation devices

Wheeled chairs, ambulation aids, equipment, and assistive devices for bathing, etc.

Health (ICF) (AOTA 2002; APTA, 2001; WHO, 2001). This is recognition that the ultimate goal of intervention is to prevent or ameliorate social disadvantages that may develop as consequences of the underlying impairment (Christiansen, 1993). In addition, there is increasing emphasis on interventions for health promotion and the prevention of secondary complications, such as obesity, social isolation, and depression (Kniepmann, 1997; Rimmer, 1999).

Specific models of service delivery are often influenced by factors outside the control of the individual therapist, for example: 1) federal and state legislation imposes strict guidelines for service delivery within early intervention and school settings, 2) managed care approaches to cost containment and outcomes-based intervention limit the length and scope of treatment in hospital or rehabilitation settings, and 3) rising health care costs and varying reimbursement practices of insurance companies limit access to outpatient services (Effgen, 2005; Rice et al., 2004). Therapy may be provided on an individual, group, or consultative basis and in varying levels of intensity. It may be delivered in a variety of settings, including hospitals, rehabilitation settings, schools, and naturalistic community environments. Therapists are required to be creative and flexible in adapting to continually changing demands of the workplace.

GUIDELINES FOR REFERRAL

Referral to physical therapy should be considered whenever a child exhibits a physical impairment, a delay in motor development, or a qualitative impairment in postural or movement skills that causes limitations in activity participation. Referral to occupational therapy should be considered whenever there is delay or qualitative impairment in the performance of daily tasks and routines, including self-care, play, social participation, or the performance of school-related tasks (Michaud & Committee on Children with Disabilities, 2004). Referral is recommended as soon as a problem is identified in order to help family members and other caregivers learn about the diagnosis, identify additional supportive services, and undertake intervention practices that will promote development and prevent further complications.

ASSESSMENT AND PLANNING FOR INTERVENTION

Initial assessment should include 1) a review of background information from records and dis-

cussion with other professionals involved with the child; 2) an interview with family or other caregivers to determine their needs, concerns, and priorities for the child; and 3) observation of the child at play or when performing functional activities within his or her natural environment. Therapists then clinically assess the child for muscle tone and strength, joint range of motion, sensory responses and perception, neurological maturation and organization, and social and behavioral responses. Standardized tests of motor, perceptual, and functional development are usually administered to confirm impressions gained from the clinical assessment.

A treatment plan is then developed based on the results of the assessment, the priorities of the child and family, and the coordinated recommendations of other professionals involved with the child. It is extremely important that the referring physician, the family, and other team members are in agreement with the plan so that there will be a coordinated approach to intervention. The plan should address the model of intervention that is recommended (e.g., individual, group, consultative), the optimal frequency of therapy sessions, recommendations for special equipment or environmental adaptations, and the plan for instruction to family members and others. Goals are developed for a specific time period, with objective and measurable objectives delineated. Periodically, the plan is reevaluated and revised as necessary.

THERAPY IN EARLY INTERVENTION PROGRAMS

Therapy services in early intervention programs may include screening for motor or perceptual problems, monitoring the development of the child over time, consulting with families and other members of the team, and providing direct therapy. Often, the emphasis is more on helping the family to adjust to the developmental delay or disability than on correcting specific problems. Attention is given to encouraging parents to develop a satisfying and nurturing relationship with their child and to learn practical methods for supporting their child's development in the natural environments of the home and community. Through the process of developing an individualized family service plan (IFSP), therapy goals are organized around helping the family engage in daily routines and meaningful rituals that are unique to the child's family unit (DeGraee, 2003).

THERAPY IN EDUCATIONAL SETTINGS

Since the passage of the Education for All Handicapped Children Act of 1975 (PL 94-142), occupational therapists and physical therapists have worked with students with disabilities in public school settings as a "related service" to help the student benefit from special education or gain access to the general education program. Other legislation, including the Individuals with Disabilities Education Act (IDEA) of 1990 (PL 101-476) and its reauthorizations in 1997 (PL 105-17) and 2004 (PL 108-446) have further clarified the model of service delivery in this setting. Even children with disabilities who do not require special education services (e.g., those with congenital amputations or a medical condition such as juvenile rheumatoid arthritis) may be eligible for services and accommodations under other entitlements, including the Americans with Disabilities Act (ADA) of 1990 (PL 101-336), Section 504 of the Rehabilitation Act of 1973 (PL 93-112), or state regulations governing education.

Therapists may fulfill multiple roles in support of a student's educational objectives. These may include 1) promoting safe and efficient mobility, 2) recommending classroom positioning that supports optimal postural control, 3) modifying materials and routines to improve attention and organization, 4) treating perceptual and motor impairments and functional limitations to assist the student from benefiting from special education, 5) promoting independence in self-care, and 6) planning for transitions and contributing to prevocational training. Because federal legislation is designed to support the student's performance only in the school environment, some children with disabilities may require additional therapy in a clinical setting for their functional needs to be fully addressed.

A variety of service models are used for implementing school-based therapy (Case-Smith, Rogers & Johnson, 2001; Effgen, 2005). Direct service means that the therapist has frequent contact with the student, either individually or in a group, to provide selected interventions. This service model is often used for students with severe or newly acquired disabilities that limit performance or for those who require consistent, hands-on therapy to meet educational objectives. Monitoring involves the development of an intervention plan that can be effectively carried out by the teacher or other school personnel. Infrequent direct contact by the ther-

apist is required to establish the effectiveness of the intervention and to update and revise the plan based on the student's progress. Consultation refers to the sharing of specialized knowledge with other education team members to support the overall goals of the educational program. Consultation may be oriented toward 1) the student (e.g., recommending adapted sports equipment to allow a student to participate with peers during gym class, 2) colleagues (e.g., providing in-service education to teachers regarding strategies to promote good handwriting habits), or 3) the educational system (e.g., recommending environmental adaptations that allow all students with mobility limitations to participate in extracurricular activities). Therapists may also be involved in prereferral assessments and interventions for students who are struggling in school but have not yet been identified as having a specific disability. Current practice supports the concept of inclusion so that interventions are often carried out in the student's natural environment, in the presence of peers, and with the typical tasks and materials that are expected of other students (Case-Smith & Cable, 1996).

SELECTED APPROACHES TO INTERVENTION

Many frames of reference exist to guide a therapist's selection of specific interventions. They are based on theories that reflect the philosophical beliefs of the profession and include an organized scheme for methods of treatment and for evaluation of the expected outcome of intervention. The following sections describe several popular approaches to intervention for children with developmental disabilities.

Motor Learning

Theories underlying how children with neuromuscular disorders, such as cerebral palsy, learn to move are in continual evolution. In the past, most physical therapists and occupational therapists approached treatment using one of several developmental frames of reference with the belief that motor development progressed according to a hierarchy of predictable, sequential steps and that progression of these steps was dependent on maturation of the central nervous system. Neurodevelopmental therapy (NDT), based on the work of Drs. Karel and Berta Bobath, has been one of the most widely used developmental approaches to motor learning

h the effectiveness of pdate and revise the i progress. Consulta- of specialized knowl- n team members to of the educational y be oriented toward mending adapted a student to partici- n class, 2) colleagues education to teachers mote good handwrit- tional system (e.g., ntal adaptations that obility limitations to lar activities). Ther- ed in prereferral as- ons for students who ut have not yet been fic disability. Current cept of inclusion so en carried out in the nent, in the presence ical tasks and materi- ther students (Case-

RES

exist to guide a ther- e interventions. They reflect the philosoph- on and include an or- ods of treatment and ted outcome of inter- ceptions describe sev- to intervention for tal disabilities.

children with neuro- as cerebral palsy, learn evolution. In the past, nd occupational ther- ent using one of sev- s of reference with the pinent progressed ac- predictable, sequenial of these steps was de- of the central nervous ental therapy (NDT), s. Karel and Berta Bo- he most widely used es to motor learning

(Biggs, 2003; Bobath & Bobath, 1984; Howle, 2002). Historically, treatment using this approach focused on individualized handling techniques designed to control abnormal patterns of movement while facilitating more normal patterns, thus promoting motor learning through the sensory feedback associated with active movement. Research on the efficacy of NDT poses many challenges, as treatment is not delivered in a standardized manner because there are considerable differences in the skill level of individual therapists and in the family's participation in daily therapy routines (Law & King, 1993). Nevertheless, current evidence suggests that although there may be some improvement in range of motion and quality of movement during treatment using an NDT approach, there is no evidence of long-term changes that produce normal movement patterns or increase functional movement (Butler & Darrah, 2001).

Newer theories of motor learning suggest that a systems approach to motor development is more efficacious than a purely developmental approach (Duff & Quinn, 2002; Larin, 2000). Some of the specific positioning and handling techniques used in NDT remain popular. However, the central nervous system is no longer believed to be the primary structure involved in learning to move. Therapists now recognize that multiple variables—including underlying impairments of the musculoskeletal system, cognitive ability to solve a motor dilemma, motivation to learn, task requirements, and practice effect—must be manipulated in varying combinations to cause lasting changes in motor behavior (Westcott & Goulet, 2005). Rigorous study of the effects of these combined approaches to therapy has yet to occur.

Sensory Integration Therapy

Sensory integration (SI) refers both to a theory and a model for therapy that has evolved since its introduction by A. Jean Ayres in the 1960s (Ayres, 1972; Bundy et al., 2002; Schaaf & Miller, 2005). It was originally developed to address the sensory processing, perceptual, and motor impairments of children with learning disabilities or other forms of developmental disability, but is now applied to children with a wide range of disabilities (Roley, Blanche, & Schaaf, 2001). Ayres defined sensory integration as a normal developmental process involving the ability of the child's central nervous system to organize sensory feedback from the body and the environment in order to make

successful adaptive responses. Children who have impairments in processing and integrating sensory inputs may exhibit problems with motor planning and execution and behavioral organization, which can have a significant impact on their learning and emotional well-being. Therapy is individually planned and focuses on providing the child with controlled sensory input to create a milieu that promotes the child's success in making adaptive responses to environmental challenges. Proponents of SI contend that therapy enhances neural organization, leading to more mature learning and behavior patterns. Thus, rather than teach specific skills, the goal of intervention is to enhance the brain's ability to learn. As with other developmental approaches to intervention, there is limited evidence to support its efficacy as a primary intervention (Holm, 2000; Mulligan, 2002; Vargas & Camilli, 1999).

As with NDT, current application of SI may be best viewed as a systems approach to manipulating multiple variables in an effort to help the child achieve progressively more mature adaptive responses. Modification of classroom materials and routines to reduce motor challenges can help the child focus attention more effectively on the cognitive aspects of learning. Examples include providing a chair with armrests and a nonslip seat for the child who fidgets in class, using an adapted pencil grip for the child with immature grasp who fatigues during writing, or placing color-coded page separators for the child who is slow to locate assignments in a workbook. Cognitive and behavioral strategies may be effective in helping children learn specific functional motor behaviors that limit their successful participation in sports or recreational activities (Mandich et al., 2001; Polatajko et al., 2001). Group therapy organized around a common recreational interest may focus on preventing or minimizing the negative social consequences associated with learning differences, including problems with peer social interaction and self-esteem (Williamson, 1993).

Constraint-Induced Movement Therapy

Constraint-induced (CI) movement therapy is a promising new treatment approach for improving upper-limb function in children with hemiplegia resulting from cerebral palsy or acquired neurological injury (Gordon, 2005; Plummer, 2003). In hemiplegia, the sensory and motor

impairments that compromise unilateral movement efficiency cause many children to avoid using the affected extremity. Over time, this can result in a learned pattern of nonuse that can further exacerbate the impairments. The methodology used in CI therapy involves several components. First, the unaffected extremity is gently restrained, often using a removable cast or sling. Next, the child is engaged in unilateral exercises, games, and other motivating activities that demand forced use of the affected extremity. The choice of activities is based on specific movement goals that are selected by the therapist and are then broken down into small steps to be accomplished in a process known as shaping. Intensive practice in movement activities combined with positive reinforcement for each small success are critical components of the approach. Studies suggest that CI therapy may improve both motor function and quality of life for children with hemiplegia and that gains appear to be sustainable over time (Bonnier, Eliasson, & Krumlinde-Sundholm, 2006; Gordon & Wolf, 2006; Taub et al., 2004).

Orthotics

Orthotic management refers to the use of splints or braces to improve or maintain motor function. It may be used as an isolated intervention or as an adjunct to therapy. Splints may be either static (rigid) or dynamic (with moveable parts). They may serve a variety of purposes: 1) to support weak muscles, 2) to increase or maintain muscle length needed for mobility, 3) to control involuntary movement, 4) to immo-

bilize a body part, and 5) to serve as a base of support for the attachment of toys or self-care devices (Blanchet & McGee, 1996).

Lower extremity orthotics, such as molded ankle-foot orthoses (MAFOs), are worn inside the shoes. For example, they are commonly used to enhance ambulatory function in children who have neuromuscular problems, like *Kia*. Children with significant lower extremity weakness may require more extensive orthoses that support the knees and/or hips to achieve ambulation.

Static resting hand splints are often used to maintain muscle length and prevent the development of secondary musculoskeletal deformity in children with increased muscle tone. Their use during periods of inactivity, such as sleep, may promote increased flexibility and improved hand function when they are removed. Other splints support the hand in positions that improve function during purposeful activity. For example, a splint that supports the wrist in slight extension may make it easier for the child to oppose the thumb to other fingers, allowing a more functional grasp of objects. Dynamic hand splints may be designed to selectively increase muscle strength or to control abnormal patterns of movement. Figure 37.1 presents two examples of static splints commonly used by physical and occupational therapists.

Assistive Technology and Assistive Technology Services

The broad term *assistive technology*, sometimes called "AT," is used to describe a variety of de-

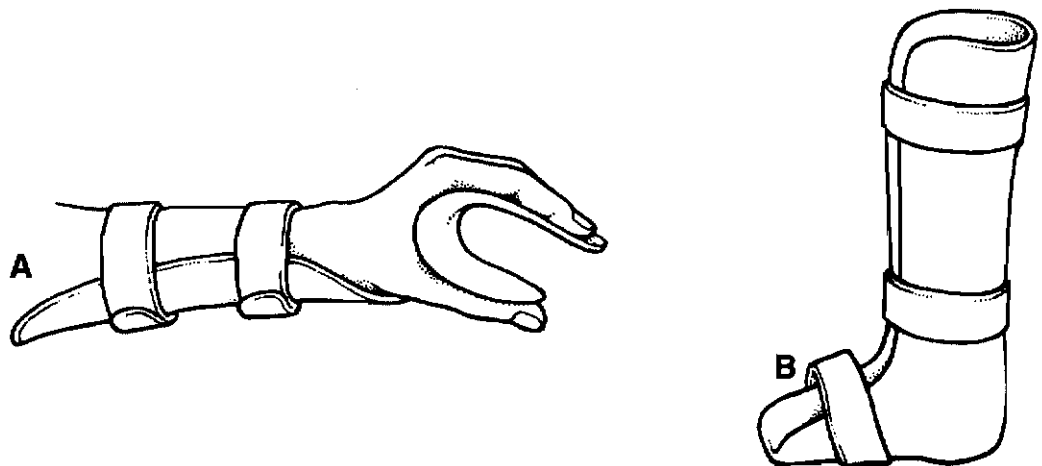


Figure 37.1. A) Resting hand splint prevents deformity by maintaining a flaccid or spastic hand in a functional position; B) molded ankle-foot orthosis (MAFO) maintains the ankle in a desired position and prevents unwanted motion during gait.

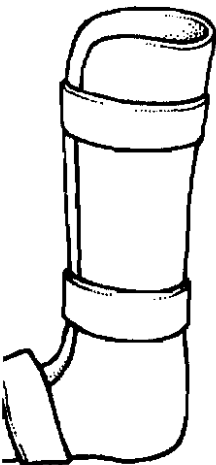
o serve as a base of
of toys or self-care
e, 1996).

tics, such as molded
Ds), are worn inside
they are commonly
ry function in chil-
lar problems, like
ant lower extremity
e extensive orthoses
/or hips to achieve

lints are often used
and prevent the de-
sculoskeletal defor-
reased muscle tone.
of inactivity, such as
ed flexibility and im-
n they are removed.
and in positions that
purposeful activity.
supports the wrist in
it easier for the child
her fingers, allowing
f objects. **Dynamic**
ned to selectively in-
to control abnormal
ure 37.1 presents two
commonly used by
therapists.

Technology Services

technology, sometimes
cribe a variety of de-



A) in a functional position; B)
in motion during gait.

vices and services that help children with disabilities to be included in a full range of social experiences and to function more independently, thus improving their quality of life (see Chapter 36). Assistive technology may be as simple as an enlarged spoon handle to compensate for a weak grasp, as commonplace as a wheelchair to promote mobility within the environment, or as sophisticated as individually designed computerized systems for augmentative communication using synthesized speech. Assistive technology devices include products that are purchased commercially, modified, or custom designed according to the specific needs of the user. Occupational therapists and physical therapists work with other team members to select or design appropriate assistive technology intervention, to secure funding, and to provide training to the child and other caregivers.

Even very young children may benefit from early training in the use of technology (Ostensjo, Carlberg, & Vollestad, 2005). For example, typically developing infants as young as 6 months are capable of understanding the cause-and-effect relationships necessary to operate a single-switch computer program. Early intervention programs teach young children how to use devices that promote their independence, because children who are able to enter school with these technologies in place may be better prepared to meet with success in the general education classroom.

A number of laws—including the Technology-Related Assistance for Individuals with Disabilities Act of 1988 (PL 100-407) and its recent amendments, the Assistive Technology Act of 2004 (PL 108-364), the ADA, the Rehabilitation Act of 1973, and IDEA 2004—have improved access to assistive technology devices and services for children. These laws have provided funding not only for the purchase or lease of equipment but also for services to ensure success with their use. Services supported under IDEA 2004 include 1) evaluation of the child's technological needs; 2) obtaining the needed equipment; 3) modifying, maintaining, and repairing equipment; 4) coordination of technology with other therapy services; 5) training the child and family; and 6) training for school personnel (Jones & Gray, 2005). If an evaluation indicates that a student requires assistive technology in order to benefit from special education, it must be provided as an integral element of the student's IEP. This means that public schools hold the legal responsibility for evaluation, device selection and acquisition, and train-

ing in the use of educationally relevant assistive devices. When assistive devices are recommended for purposes that are not related to educational objectives, creative strategies for funding equipment must be identified. Examples of potential funding sources include Medical Assistance, Supplemental Security Income (SSI), private foundations or donors, and durable medical equipment riders on private insurance policies.

OUTCOMES OF THERAPY

Therapists are increasingly challenged to demonstrate that the interventions they select are supported by scientific evidence and focus on relevant outcomes. They use a variety of sources of evidence to support their treatment decisions, including review of published research, personal experience and tradition, textbooks and manuals, the values and beliefs of the client, and the opinions of others who are considered to be expert (Lee & Miller, 2003; Maher et al., 2004; O'Donnell & Roxborough, 2002). Although research is an important component of evidence-based practice, the nature of therapy does not easily lend itself to the randomized controlled trials (RCT) traditionally accepted by the medical community. Methodological issues exist, including those in the measurement of treatment-related change in the presence of developmental maturation and the heterogeneity of populations. In addition, physical therapy and occupational therapy differ from most medical interventions in that they are more aptly described as dynamic processes that involve active participation by the child and family, as opposed to standardized procedures in which the child assumes a more passive role (Lee & Miller, 2003; Michaud & Committee on Children with Disabilities, 2004).

Tools used to measure the effectiveness of intervention need to demonstrate not only that gains made during therapy can be sustained over time and in the child's natural environment but also that they result in an improved quality of life for the child and family (Chen et al., 2004; Law, 2003). For example, children like Kia with cerebral palsy frequently receive physical therapy to improve mobility skills. One typical outcome measure, easy to obtain during therapy, is increased joint range of motion as measured by goniometry. The real value of this outcome must be questioned, however, unless mobility gains can 1) be easily maintained by parents or other caregivers at home; 2) prevent

the need for more invasive orthopedic or other medical intervention; 3) reduce the costs for special education and related services; or 4) promote access to social, educational, or recreational experiences that are important to the child and family. Therapists must be prepared to justify that recommended interventions are appropriate (i.e., address the needs as stated by the consumer), effective (i.e., achieve targeted outcomes), and efficient (i.e., are available at the lowest cost possible). Examples of pediatric functional assessment tools in common use include the Pediatric Evaluation of Disability Inventory (PEDI; Coster & Haley, 1992; Ostensjo et al., 2006), the Uniform Data Set for Medical Rehabilitation for Children (WeeFIM; Msall, DiGaudio, & Duffy, 1993), and the School Function Assessment (SFA; Coster et al., 1998).

SUMMARY

Pediatric occupational therapy and physical therapy strive to minimize the effects of impairment, to promote full inclusion into society, and to enhance the overall quality of life for children with disabilities and their families. Although the two disciplines may overlap in certain knowledge and skills, there are important differences in their primary focus for intervention. Although therapists use a variety of sources of evidence to support their methodology, further research is needed to support the clinical efficacy of certain interventions commonly used in practice.

REFERENCES

- American Occupational Therapy Association. (2002). Occupational therapy practice framework: Domain and process. *American Journal of Occupational Therapy, 56*, 609-639.
- American Physical Therapy Association. (2001). Guide to physical therapy practice (2nd ed.). *Physical Therapy, 81*, 9-744.
- Americans with Disabilities Act (ADA) of 1990, PL 101-336, 42 U.S.C. §§ 12101 et seq.
- Assistive Technology Act of 2004, PL 108-364, 29 U.S.C. §§ 3001 et seq.
- Ayres, A.J. (1972). *Sensory integration and learning disorders*. Los Angeles: Western Psychological Services.
- Bigsby, R. (2003). Developmental and neurological perspectives. In E.B. Crepeau, E.S. Cohn, & B.A.B. Schell (Eds.), *Willard and Spackman's occupational therapy* (10th ed., pp. 243-252). Philadelphia: Lippincott, Williams & Wilkins.
- Blanchet, D., & McGee, S.M. (1996). Principles of splint design and use. In L.A. Kurtz, P.W. Dowrick, S.E. Levy, et al. (Eds.), *Handbook on developmental disabilities: Resources for interdisciplinary care* (pp. 465-480). Gaithersburg, MD: Aspen Publishers.
- Bobath, K., & Bobath, B. (1984). Neuro-developmental treatment. In D. Scrutton (Ed.), *Clinics in developmental medicine: No. 90. Management of the motor disorders of children with cerebral palsy* (pp. 6-18). New York: Cambridge University Press.
- Bonnier, B., Eliasson, A.C., & Krumlind-Sundholm, L. (2006). Effects of constraint-induced movement therapy in adolescents with hemiplegic cerebral palsy: A day camp model. *Scandinavian Journal of Occupational Therapy, 13*(1) 13-22.
- Bundy, A.C., Lane, S., Murray, E.A., et al. (2002). *Sensory integration: Theory and practice* (2nd ed.). Philadelphia: F.A. Davis.
- Butler, C., & Darrah, J. (2001). Effects of neurodevelopmental treatment (NDT) for cerebral palsy: An AACPD evidence report. *Developmental Medicine and Child Neurology, 43*, 778-790.
- Case-Smith, J., & Cable, J. (1996). Perceptions of occupational therapists regarding service delivery models in school-based practice. *The Occupational Therapy Journal of Research, 16*(1), 23-44.
- Case-Smith, J., Rogers, J., & Johnson, J.H. (2001). School-based occupational therapy. In J. Case-Smith (Ed.), *Occupational therapy for children* (4th ed., pp. 757-779). St. Louis: Mosby.
- Chen, C.C., Heinemann, A.W., Bode, R.K., et al. (2004). Impact of pediatric rehabilitation services on children's functional outcomes. *American Journal of Occupational Therapy, 58*(1), 44-53.
- Christiansen, C. (1993). Continued challenges of functional assessment in rehabilitation: Recommended changes. *American Journal of Occupational Therapy, 47*, 258-259.
- Coster, W., Deeney, T., Haltiwanger, J., et al. (1998). *School Function Assessment*. San Antonio, TX: Harcourt Assessment.
- Coster, W.J., & Haley, S.M. (1992). Conceptualization and measurement of disablement in infants and young children. *Infants and Young Children, 4*(4), 11-22.
- DeGrace, B.W. (2003). Occupation-based and family-centered care: A challenge for current practice. *American Journal of Occupational Therapy, 57*(3), 347-350.
- Duff, S., & Quinn, L. (2002). Motor learning and motor control. In D. Cech & S. Martin (Eds.), *Functional movement development across the life span* (2nd ed., pp. 86-117). Philadelphia: W.B. Saunders.
- Education for All Handicapped Children Act of 1975, PL 94-142, 20 U.S.C. §§ 1400 et seq.
- Effgen, S.K. (Ed.). (2005). *Meeting the physical therapy needs of children*. Philadelphia: F.A. Davis.
- Gordon, C.J. (2005). A critical review of constraint-induced movement therapy and forced use in children with hemiplegia. *Neural Plasticity, 12*(2-3), 245-61.
- Gordon, C.J., & Wolf, S.L. (2006). Efficacy of constraint-induced movement therapy on involved upper extremity use in children with hemiplegic cerebral palsy is not age-dependent. *Pediatrics, 117*(3), 363-373.
- Holm, M.B. (2000). Our mandate for the new millennium: Evidence-based practice [Eleanor Clark Slagle Lecture]. *American Journal of Occupational Therapy, 54*(6), 575-585.
- Howle, J.M. (Ed.). (2002). *Neuro-developmental treatment approach: Theoretical foundations and principles of clinical practice*. Laguna Beach, CA: NDTA Treatment Association.

- ary care (pp. 465-480). Publishers.
- 3). Neuro-developmental 1.), *Clinics in development of the motor disorders of 6-18*. New York: Cambridge.
- rumlinde-Sundholm, L. nduced movement therapeutic cerebral palsy: A *n Journal of Occupational*
- E.A., et al. (2002). *Sensory* (2nd ed.). Philadelphia:
- Effects of neurodevelopmental cerebral palsy: An *Developmental Medicine* 790.
- 6). Perceptions of occupational service delivery models *Occupational Therapy* 44.
- Johnson, J.H. (2001). *Therapy in J. Case-Smith for children* (4th ed., pp.
- Bode, R.K., et al. (2004). *ation services on children* *American Journal of Occupational*
- ued challenges of functional: Recommended *Occupational Therapy*, 47,
- wanger, J., et al. (1998). Antonio, TX: Harcourt
- 992). Conceptualization in infants and young *children*, 4(4), 11-22.
- ation-based and family-current practice. *American* 57(3), 347-350.
- otor learning and motor Martin (Eds.), *Functional the life span* (2nd ed., pp. Saunders.
- Children Act of 1975, 0 et seq.
- eting the physical therapy F.A. Davis.
- il review of constraint-induced forced use in children *icity* 12(2-3), 245-61.
- 2006). Efficacy of occupational therapy on involved upper limb hemiplegic cerebral *Pediatrics*, 117(3), 363-
- late for the new millennium (Eleanor Clark Slagle *of Occupational Therapy*,
- o-developmental treatment ns and principles of clinical IDTA Treatment Associ-
- Individuals with Disabilities Education Act Amendments of 1997, PL 105-17, 20 U.S.C. §§ 1400 et seq.
- Individuals with Disabilities Education Act (IDFA) of 1990, PL 101-476, 20 U.S.C. §§ 1400 et seq.
- Individuals with Disabilities Education Improvement Act of 2004, PL 108-446, 20 U.S.C. §§ 1400 et seq.
- Jones, M., & Gray, S. (2005). Assistive technology: Positioning and mobility. In S.K. Effgen (Ed.), *Meeting the physical therapy needs of children* (pp. 455-474). Philadelphia: F.A. Davis.
- Kniepinann, K. (1997). Prevention of disability and maintenance of health. In C. Christiansen & C. Baun (Eds.), *Occupational therapy: Enabling function and well-being* (pp. 530-555). Thorofare, NJ: Slack.
- Larin, H. (2000). Motor learning: Theories and strategies for the practitioner. In S.K. Campbell, D.W. Vander Linden, & R.J. Palisano (Eds.), *Physical therapy for children* (2nd ed., pp. 170-195). Philadelphia: W.B. Saunders.
- Law, M. (2003). Outcome measurement in pediatric rehabilitation. *Physical and Occupational Therapy in Pediatrics*, 23(2), 1-4.
- Law, M., & King, G. (1993). Parent compliance with therapeutic interventions for children with cerebral palsy. *Developmental Medicine and Child Neurology*, 35, 983-990.
- Lee, C.J., & Miller, L.T. (2003). The process of evidence-based clinical decision making in occupational therapy. *American Journal of Occupational Therapy*, 57(4), 473-477.
- Maher, C.G., Sherrington, C., Elkins, M., et al. (2004). Challenges for evidence-based physical therapy: Accessing and interpreting high-quality evidence on therapy. *Physical Therapy*, 84(7), 644-654.
- Mandich, A.D., Polatajko, H.J., Missiuna, C., et al. (2001). Cognitive strategies and motor performance in children with developmental coordination disorder. *Physical and Occupational Therapy in Pediatrics*, 20(2/3), 125-143.
- Michaud, L.A., & Committee on Children with Disabilities. (2004). Prescribing therapy services for children with motor disabilities. *Pediatrics*, 113(6), 1836-1838.
- Mulligan, S. (2002). Advances in sensory integration research. In A.C. Bundy, S.J. Lane, & E.A. Murray (Eds.), *Sensory integration: Theory and practice* (2nd ed., pp. 397-411). Philadelphia: F.A. Davis.
- Msall, M.E., DiGaudio, K.M., & Duffy, L.C. (1993). Use of functional assessment on children with developmental disabilities. *Physical Medicine and Rehabilitation Clinics of North America*, 4, 517-527.
- O'Donnell, M.E., & Roxborough, L. (2002). Evidence-based practice in pediatric rehabilitation. *Physical Medicine and Rehabilitation Clinics of North America*, 13(4), 991-1005.
- Ostensjo, S., Bjorbackmo, W., Carlberg, E.G., et al. (2006). Assessment of everyday functioning in young children with disabilities: An ICF-based analysis of concepts and content of the Pediatric Evaluation of Disability Inventory (PEDI). *Disability and Rehabilitation*, 28(8), 489-504.
- Osrensjö, S., Carlberg, E.B., & Vollestad, N.K. (2005). The use and impact of assistive devices and other environmental modifications on everyday activities and care in young children with cerebral palsy. *Disability and Rehabilitation*, 27(14), 849-861.
- Plummer, A.C. (2003). Constraint-induced therapy and the motor learning literature that underpins its application. *Physical Therapy Reviews*, 8(3), 143-149.
- Polatajko, H.J., Mandich, A.D., Miller, L.T., et al. (2001). Cognitive orientation to daily occupational performance: Part II. The evidence. *Physical and Occupational Therapy in Pediatrics*, 20(2/3), 125-143.
- Rehabilitation Act of 1973, PL 93-112, 29, U.S.C. §§ 701 et seq.
- Rice, S.A., Allaire, J., Elgin, K., et al. (2004). Effect of shortened length of stay on functional and educational outcome after pediatric rehabilitation. *American Journal of Physical Medicine and Rehabilitation*, 83(1) 27-32.
- Rimmer, J.M. (1999). Health promotion for people with disabilities: The emerging paradigm shift from disability prevention to prevention of secondary conditions. *Physical Therapy*, 79, 495-502.
- Roley, S., Blanche, E.I., & Schaaaf, R.C. (2001). *Understanding the nature of sensory integration with diverse populations*. San Antonio, TX: Therapy Skill Builders.
- Schaaaf, R.C., & Miller, L.J. (2005). Occupational therapy using a sensory integrative approach for children with developmental disabilities. *Mental Retardation and Developmental Disabilities Research Reviews*, 11(2), 143-148.
- Taub, E., Ramsey, S.L., DeLuca, S., et al. (2004). Efficacy of constraint-induced movement therapy for children with cerebral palsy with asymmetric motor impairment. *Pediatrics*, 113(2), 305-312.
- Technology-Related Assistance for Individuals with Disabilities Act of 1988, PL 100-407, 29 U.S.C. §§ 2201 et seq.
- Vargas, S., & Camilli, G. (1999). A meta-analysis of research on sensory integration treatment. *American Journal of Occupational Therapy*, 53(2), 189-198.
- Westcott, S.L., & Goulet, C. (2005). Neuromuscular system: Structures, function, diagnoses, and evaluation. In S.K. Effgen (Ed.), *Meeting the physical therapy needs of children* (pp. 185-244). Philadelphia: F.A. Davis.
- Williamson, G.G. (1993). Enhancing the social competence of children with learning disabilities. *Sensory Integration Special Interest Section Newsletter*, 16(1), 1-2.
- World Health Organization. (2001). *International Classification of Functioning, Disability and Health (ICF)*. Geneva: Author.