

Review of Selected Physical Therapy Interventions for School Age Children with Disabilities

Prepared for the Center on Personnel Studies in Special Education

EXECUTIVE SUMMARY

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August 2007

COPSSE Document No. OP-4E



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COPSSE research is focused on the preparation of special education professionals and its impact on beginning teacher quality and student outcomes. Our research is intended to inform scholars and policymakers about advantages and disadvantages of preparation alternatives and the effective use of public funds in addressing personnel shortages.

In addition to our authors and reviewers, many individuals and organizations have contributed substantially to our efforts, including Drs. Erling Boe of the University of Pennsylvania and Elaine Carlson of WESTAT. We also have benefited greatly from collaboration with the National Clearinghouse for the Professions in Special Education, the Policymakers Partnership, and their parent organizations, the Council for Exceptional Children and the National Association of State Directors of Special Education.

The Center on Personnel Studies in Special Education, H325Q000002, is a cooperative agreement between the University of Florida and the Office of Special Education Programs of the U. S. Department of Education. The contents of this document do not necessarily reflect the views or policies of the Department of Education, nor does mention of other organizations imply endorsement by them.

Recommended citation:

Effgen, S. K. & McEwen, I. R. (2007). *Review of selected physical therapy interventions for school age children with disabilities. (COPSSE Document Number OP-4E). Gainesville, FL: University of Florida, Center on Personnel Studies in Special Education.*



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INTRODUCTION

PL 108-446, the Individuals with Disabilities Education Improvement Act of 2004 [IDEA] (2004), requires special education and related services to maximize use of peer-reviewed research. This requirement is consistent with the current strong emphasis on evidence-based practice in physical therapy and the American Physical Therapy Association's [APTA] *Guide to Physical Therapist Practice*, which provides a framework for describing and implementing physical therapy. However, much of the research on physical therapy interventions for children with disabilities is weak and conducted in non-education environments. This paper reports on physical therapy procedural interventions with enough research available to have been the topic of one or more systematic reviews. The interventions covered include: adapted seating for children with cerebral palsy [CP]; conductive education; constraint-induced movement therapy; lower extremity casting, orthoses, and splints for children with neurological disorders; neurodevelopmental treatment; partial body weight supported treadmill training; passive stretching to improve range of motion [ROM]; strengthening for children with CP; and weight bearing interventions for children with CP.

A generally accepted definition of evidence-based practice is the integration of best research evidence, clinical expertise, and the values and circumstances of the individual patient. Physical therapists must integrate all these elements—research, expertise, and family/child factors—for evidence-based decision making. Therapists make judgments regarding intervention based on evidence, the timely monitoring of the child's responses and progress in achieving the anticipated goals. According to the *Guide*, intervention should include three important components: (a) coordination, communication, and documentation; (b) child/family-related instruction; and (c) procedural interventions. This paper focuses on the peer-reviewed research component of evidence-based practice; specifically, research on procedural interventions that physical therapists commonly use when working with children with disabilities in schools. The purposes of this paper are to identify: (a) effective physical therapy procedural interventions that lead to positive outcomes for children (3-21 years) with disabilities in schools; and (b) gaps in the evidence and areas requiring further research.

METHODS

Common physical therapy interventions were identified by reviewing procedural interventions in the APTA's *Guide*, the Iowa AEA Physical Therapy Consensus on Peer-Reviewed Intervention II, and pediatric physical therapy textbooks. Based on the review of those resources, we searched for systematic reviews related to the following areas of procedural interventions: assistive technology; conductive education; constraint-induced movement therapy; fitness, aerobic capacity, and endurance; function/goal-directed therapy; motor learning; neurodevelopmental treatment [NDT]; orthoses and casts; treadmill training; passive ROM and stretching; positioning; postural control; power mobility; strengthening; walking aids; and weight bearing. The databases searched included the Cochrane Database of Systematic Reviews, CINAHL, ERIC, MEDLINE, PsycINFO, PEDro, and APTA'S *Hooked on Evidence* using a defined list of search terms. We included all the systematic reviews that met the following criteria:

- published in a peer-reviewed source
- focused on procedural physical therapy interventions with children aged 3-21 years with disabilities. The interventions could take place in any environment (limiting the review to studies completed in schools would have severely restricted the research available for review)
- published in English.

Each of the identified systematic reviews used a grading system to evaluate the research, including the well-established Sackett system to grade the quality of research in medicine (Levels I-V) and similar scales developed by the American Academy of Cerebral Palsy and Developmental Medicine [AACPDm]; the Centre for Evidence Based Medicine [CEBM]; and the Center for

Evidence Based Physiotherapy [CEBP]. Each author of this paper read and summarized the systematic reviews on approximately half of the procedural interventions.

RESULTS: SYSTEMATIC REVIEWS OF INTERVENTION PROCEDURES

Systematic reviews of the following interventions used with school age children with disabilities were found: (a) adapted seating for children with CP; (b) conductive education [CE]; (c) constraint-induced movement therapy [CIT]; (d) lower extremity casting, orthoses, and splints for children with neurological disorders; (e) neurodevelopmental treatment [NDT]; (f) partial body weight supported treadmill training [PBWSTT]; (g) passive stretching to improve ROM; (h) strengthening for children with CP; and (i) weight bearing interventions for children with CP. The results of these reviews are summarized below.

Adapted Seating for Children with Cerebral Palsy

Physical therapists often recommend and/or provide adaptive seating for children with CP, muscular dystrophy, and other conditions involving the neuromuscular and musculoskeletal systems. Proposed benefits of adaptive seating include improved postural control and alignment, improved hand and arm function, and prevention of deformities. Research indicates that adaptive seating can affect a child's function and postural control. A stable pelvis probably is important; and seating orientation is likely to make a difference for at least some children during certain tasks. This conclusion is consistent with a review of evidence of effects of positioning on upper extremity function in children with CP. The evidence supports an orientation in space of 0 to 15 degrees and a seat sloped forward 0 to 15 degrees, with the exact angle needing to be determined on an individual basis. Physical therapists should systematically evaluate children's functioning in various positions and with adapted seating having various features to determine optimal positions for children who lack good postural control.

Conductive Education (CE)

CE is a holistic approach to the development and education of children with neurological dysfunction, predominantly CP. Physical therapists may provide the integrated gross motor portion of this curriculum. CE is not a therapy system but a system of education that aims to teach and motivate the child to function in society. Emphasis is placed on motivation, developing self-esteem, emotional and cognitive growth, and motor function. This school-based comprehensive program has gained popularity around the world.

The systematic reviews indicated that CE is as effective as traditional physical therapy when intensity of intervention is controlled. In general practice not involving research, CE has a higher level of intensity of intervention than traditional therapy. Further investigation is clearly warranted.

Constraint-Induced Movement Therapy (CIT)

CIT, previously referred to as forced use therapy, is a relatively new procedural intervention used by physical therapists. Developed for adults post-stroke, the protocol involves the forced use of the impaired upper extremity while the other (non-impaired) extremity is constrained for most waking hours by a sling, mitt, or cast. CIT appears to be a promising intervention for improving hand function in children with hemiplegia. Several less intrusive protocols have been studied with the children with shorter wearing times of the splint or cast than used in CIT for adults. No one protocol has been determined to be the most effective. Further research is needed to know if CIT can be successfully implemented in a school setting, especially for children with hemiplegic CP who are usually fully integrated into the general education curriculum.

Lower Extremity Casting, Orthoses, and Splints for Children with Neurological Disorders

Physical therapists often recommend casting, ankle-foot orthoses, and/or splints to maintain or improve lower extremity ROM, particularly ankle ROM; improve children's postural alignment in

standing; and improve walking in children with disabilities. The evidence on effectiveness of casting, orthoses, and splints for children with neurological disorders supports casting for increasing dorsiflexion ROM, but the influences on gait and function as well as long-term effects are unknown. The research on effects of orthoses and splints is inconclusive, except that designs intended to reduce muscle tone do not appear to improve functional skills and limiting plantar-flexion does appear to reduce equinus gait.

Neurodevelopmental Treatment (NDT)

NDT has been a commonly used approach for intervention of children with CP and other developmental disabilities. The therapist uses a hands-on approach to facilitate normal movement patterns and to inhibit abnormal movement. The normal movement patterns are expected to carry over into daily functional activities. One study of NDT found that ROM improved immediately after the therapy session, although no longer term effects have been established. In addition, there has been no conclusive evidence that NDT produced benefits in parent satisfaction, parent-child interactions, cognition, language, or social/emotional domains. Further research on the numerous specific elements of NDT and the many possible outcomes needs to be investigated because the effectiveness of NDT has not been supported through the published literature.

Partial Body Weight Supported Treadmill Training (PBWSTT)

A relatively new intervention approach, PBWSTT, first used with adults post-stroke and others with neurological impairments—is now being used with children with neurological disabilities. The child is suspended with varying amounts of support over a treadmill and is given manual assistance to walk on the moving treadmill. Studies have concluded that PBWSTT has potential to be an effective intervention for improving gait in children with delays and deviations in ambulation as well as the motor skills of children with spastic CP. PBWSTT requires the direct intervention of a therapist and relatively major equipment as well as appropriate space for the equipment and the intervention, but it is not unrealistic to consider this in a school setting.

Passive Stretching to Improve Range of Motion (PROM)

Although improving ROM is not a functional goal of intervention, we often have observed passive stretching for students with disabilities, particularly students with severe CP. A number of studies found that serial casting increased ROM, at least relatively soon after removal of the cast. Studies that measured the effect of PROM exercises on ROM measurements found no conclusive evidence supporting the effectiveness of PROM exercises. The clinical significance of any reported increases in ROM also is unknown; and no research has investigated relations between passive stretching and individualized education program [IEP] goals or other functional skills. None of the studies compared a prolonged stretch with PROM exercises, although a prolonged stretch may be more effective.

Strengthening for Children with Cerebral Palsy

Muscle strengthening programs are commonly used to strengthen individual muscles and groups of muscles to improve function in children having a variety of disabilities. The evidence supporting specific strengthening programs for children is quite variable depending on the specific diagnosis. Muscle strengthening programs have not been universally accepted for children with disabilities involving upper motor neurons or degenerative disease. Only in the past decade have improvements in functional outcomes for children with CP been documented after muscle strengthening programs. Continued research is required to identify the most effective and efficient strengthening protocol to use, specifically how to improve functional tasks for children with all disabilities, especially in school settings.

Weight Bearing Interventions for Children with Cerebral Palsy

Physical therapists often provide weight bearing interventions for children with CP in an attempt to increase or maintain ROM, reduce spasticity, or improve bone growth and bone mineral density [BMD]. Studies in this group examined weight bearing in upper extremities (e.g., hands and arms) and lower extremities (e.g., standing). The evidence on the effect of weight bearing on hand

function is inconclusive, and the clinical significance of any positive findings is unclear. Static weight bearing may be effective for increasing BMD in children with CP. The association between increased BMD and incidence of fractures still needs to be studied. The effect of lower extremity weight bearing on function also needs to be examined.

DISCUSSION

This project started by searching for research on over 20 interventions that physical therapists commonly have used for children with disabilities. Our results yielded 13 systematic reviews on 9 interventions, with no meta-analyses. The newest interventions—CIT and treadmill training—have the strongest and most recent research support, although specific protocols to achieve specific outcomes require further investigation. Traditional common interventions for children with disabilities, such as NDT and PROM, have enough research for systematic reviews but little evidence to support their effectiveness.

Research supports positive effects of seating adaptations on the function of children with disabilities. More research is needed, not only to further examine effects of various seating adaptations on function, but also to determine effects of positioning in other devices, such as standing and sidelying, on education-related activities of children with disabilities. Systematic reviews indicated that CE is as effective as traditional physical therapy when intensity of intervention is controlled. The intensive and integrative nature of CE, combining education and therapy into meaningful, functional activities could serve as a best-practices model for therapeutic interventions.

Research on the effects of passive stretching on ROM is inconclusive, with some studies finding no effect and other studies finding some effect for some children. PROM exercises may maintain or increase ROM in some children, but the functional relevance should be questioned. Research does support a positive effect of weight bearing, including standing in a stander, on bone density.

Muscle strengthening, a well-accepted intervention used by physical therapists, now has a body of research to support programs for children with CP. Research for children with other disabilities is limited, although there have been studies on children with Down syndrome, myelomeningocele, and juvenile rheumatoid arthritis.

Research supports positive effects of lower extremity casting on dorsiflexion ROM of children with CP, but the long-term effects and influence on ambulation are questionable. Effects of different orthoses on various activities of individual children need to be measured and monitored.

Few systematic reviews addressed the issue of the specific protocol to achieve specific outcomes. Knowing how to provide sufficient but not excessive intervention to achieve the desired outcomes is the aim. Further investigation, especially studies of children in schools in the U. S. is needed to assist in determining the most appropriate frequency, intensity, and duration of intervention and whether increasing intensity during critical periods of skill acquisition facilitates the rate of motor skill development.

SUMMARY

In physical therapy, the body of peer-reviewed research to provide guidance for decisions about services for children with disabilities is somewhat limited, particularly for physical therapy services in schools. We urge agencies responsible for the health and education of students with disabilities to increase the availability of funding for research that will answer important questions about effective school-based physical therapy services. Based on our review of current research evidence and knowledge of common and emerging practices, we recommend that future research focus on the following areas:

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- Interventions shown to be effective in laboratory or other controlled environments must be studied with students with disabilities in school and other educational environments in which school-based physical therapists work with students with disabilities.
 - Interventions that apply motor-learning principles have promise, but research on the effects of motor-learning interventions on acquisition of meaningful motor skills in children with disabilities in schools is lacking. Research is especially needed to study aspects of motor-learning intervention, such as intensity, schedule, and type of practice and feedback.
 - Research is needed to identify and develop measures and methods that can predict relevant outcomes of students with disabilities.
 - Research is needed to determine the most effective and efficient duration, frequency, and intensity of both physical therapy intervention and practice of motor skills.