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PEDIATRIC PHYSICAL THERAPISTS AND EVIDENCE-BASED PRACTICE: A
PARTICIPATORY ACTION RESEARCH PROJECT

by

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A Dissertation Submitted in Partial Fulfillment of the Requirements for the
Degree of DOCTOR OF PHILOSOPHY

Ph.D. Program in Rehabilitation Sciences

THE RANGOS SCHOOL OF HEALTH SCIENCES

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JUNE 22, 2007

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Dissertation Approval
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June 22, 2007

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PARTICIPATORY ACTION RESEARCH PROJECT

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ABSTRACT

Introduction: The purpose of this project was to describe in detail the attitudes, beliefs, and practices of a group of pediatric physical therapists regarding evidence-based practice. In addition, utilizing a collaborative, participatory action research approach, several strategies and outcomes were identified as a means to aid these individuals in improving their ability to use research evidence for clinical decision making.

Methods: The primary investigator and a group of five pediatric physical therapists collaborated to develop and implement strategies and outcomes that were best suited for each individual. During phase I, information was gathered to describe the participants' current beliefs, attitudes, and practices with regard to evidence-based practice. This information was used to develop group and individual strategies, which were implemented during phase II. During phase III, the outcomes were identified and described. A variety of methods were used to gather information throughout all phases, including individual and focus group interviews, document review, surveys and questionnaires, and self-reported Goal Attainment Scaling scores. **Results:** The results were organized into five individual case reports for each of the participants and a description of the Practice. *Practice:* Most of the participants worked in a setting as the only physical therapist and most were over 40 years of age and had been practicing for longer than 15 years. All had a positive attitude toward evidence-based practice. However most reported reading less than two articles per month and performing less than two database searches per month and lacked confidence with these skills. The participants demonstrated a significant improvement ($p < .05$) in their knowledge and behaviors regarding research and evidence-based practice at the conclusion of the project.

Participant K reported little confidence with evidence-based practice skills. The group and individual strategies during the acting phase were helpful but insufficient in helping her overcome her barriers to make a significant improvement. Participant P, the owner of the Practice, reported functioning at a high level with regard to evidence-based practice, and therefore reported little improvement in evidence-based practice skills or activities. Participant A, a recent graduate, ranked herself fairly highly initially and indicated that the strategies in this project were an impetus to resume utilizing the skills she had learned during her entry-level education. Participant R described less confidence with her evidence-based practice skills and reported an improvement in these skills at the conclusion of the project. Participant L reported some confidence initially with her evidence-based practice skills, and this project was helpful, although she reported a persistent lack of confidence with article analysis skills.

Discussion: Each of the participants described positive attitudes and beliefs towards the construct of evidence-based practice, along with a desire to increase their skills in this area. The quantitative and qualitative data seem to suggest that there was some improvement in the participants' knowledge and behavior with regard to research evidence. However, the participants also reported continued struggles with carrying out evidence-based practice activities.

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DEDICATION

This project is dedicated to my professional colleagues- pediatric physical therapists- who work every day to improve the lives of children. It has been an honor to be a part of this profession and to work alongside you in this passionate endeavor.

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Chapter I Introduction

In 1601, Captain James Lancaster of the British Navy attempted a small experiment.

During a voyage, he gave the crew on one of the four ships under his command a ration of lemon juice each day, while the crew on the other three ships did not receive the lemon juice ration. At the halfway point of the voyage, Captain Lancaster discovered that 40% of the crew members on the other three ships died of scurvy while none of the crew receiving the lemon juice died. Despite these compelling results, albeit from a non-randomized study with an extremely small sample size, practice did not change. In fact, dietary practices in the British Navy did not change for another 194 years. Finally, in 1795, after several replications of Lancaster's experiment, a daily citrus fruit ration became a mandatory requirement on all Navy ships.¹

New knowledge is constantly being generated by research. However, as Captain Lancaster's experiment illustrates, the challenge of disseminating and translating knowledge into practice and routine decision making has existed for centuries. These challenges are not unique to any one field of study or profession. For example, the processes of disseminating and translating knowledge into practice have been well characterized in the social sciences and are referred to as "diffusion of innovation."² This is defined as the process through which an idea, practice, or object that is perceived as new is communicated through certain channels over time among members of a social system.² Once the innovation has been shown to be effective, the challenge becomes developing and implementing effective diffusion strategies.

Several factors influence whether an innovation becomes diffused. These include how the innovation is perceived by its intended users, the individual characteristics of the people who would use the innovation, and contextual factors such as leadership, management, the presence or absence of incentives to adopt the innovation, and communication amongst interested parties.² As scientific research demonstrates the effectiveness of an innovation, each of these factors must be considered in order to facilitate the diffusion process.²

The Medical profession has attempted to “diffuse innovations” by promoting the construct of evidence-based medicine. Evidence-based medicine was first described by Sackett et al³ in the 1990s and was initially defined as the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients.³ The goal of evidence-based medicine was for physicians to obtain the best evidence available for a given clinical condition and then to apply this knowledge to diagnosis and treatment.

This early formulation downplayed traditional determinants of clinical decisions, including physiologic rationale and individual clinical experience.⁴ Evidence-based medicine represented a radical shift away from a longstanding and well established paradigm of knowledge that was based on autonomy and clinical experience.⁵ Evaluating a large body of medical literature and disseminating the most valid and important findings to the medical community were emphasized so that this information could also be integrated into clinical decision making.⁶ New skills such as rapidly and efficiently

searching the research literature and applying of formal rules of evidence in evaluating the clinical literature were required.⁷

Over the past 10-15 years in physical therapy, diffusion of innovations and integration of research evidence into practice has been fostered in a similar way through the concept of evidence-based practice.^{5, 8-28} Evidence-based practice represents an outgrowth of evidence-based medicine, and expands the construct to include a wide array of health care practitioners in addition to physicians.⁹ The definition has been broadened as well and is no longer limited only to the use of best evidence to guide practice. The most contemporary definitions of evidence-based practice reflect the integration of individual clinical expertise, individual patient preferences and actions, clinical state and circumstances, and the best available external clinical evidence from systematic research in order to best guide clinical decision making.^{3, 4, 7, 29} The exclusive use of scientific evidence from research is inadequate for clinical decision making, and evidence-based decisions will vary from patient to patient. In fact, more recently, one group of authors has suggested a move away from the term evidence-based practice and toward “research enhanced health care” as a means of taking into consideration all of the factors that lead to an optimal clinical decision.²⁹

An important underlying assumption of evidence-based practice is that all health care practitioners should know about the evidence that exists concerning effectiveness of the treatments they provide. Along with the ethical imperative to provide patients with the best possible treatments, the current political and economic climate demands that

physical therapists demonstrate that their services are worth purchasing.^{8,9} Since clinicians are the interface between evidence and patients, they bear much of the responsibility for the utilization of evidence-based practice.

On the surface, evidence-based practice has intuitive appeal to enhance clinical decision making. But presently, it is unclear whether this construct is either efficacious or even feasible in clinical practice. First, there is no evidence that physical therapy practice, based on an evidence-based practice approach, is more effective in improving clinician performance or patient outcomes.¹⁶ Second, although there is an ever-expanding foundation of research to support physical therapy practice, a relatively limited amount of the evidence is both high quality, according to the Sackett hierarchy³⁰, and clinically relevant.^{13, 31, 32} Finally, despite the ubiquitous nature of the evidence-based practice construct in the profession, many physical therapist clinicians continue to base clinical decisions on factors other than information from scientific research.^{12, 24, 25, 33-35}

Challenges to Achieving Evidence Based Practice

Despite the ongoing effort to move physical therapy toward evidence-based practice, a number of barriers have been identified.^{19, 36-39} The effort to translate knowledge into practice has recently begun to receive more attention.¹ There is a growing concern that the ideal of clinical practice, guided by research evidence, lags behind the reality of physical therapy practice, and that more of an effort must be made to consider and address this issue.¹ For the purposes of this review, these challenges have been grouped into three main areas: research methods, clinicians' skill, and administrative factors.

Challenge Number 1: Research Methods

According to Sackett et al³⁰, the quality or strength of research evidence is classified according to a hierarchy that sorts evidence according to rigor and potential for confounding variables to influence the research outcomes (see Table 1).³⁰ For example, scientific evidence generated by systematic reviews of randomized controlled trials (RCTs) is at the top of this hierarchy, while case reports and expert opinion are at the bottom.³⁰ Physical therapists are encouraged to consider a study's "level of evidence" in the process of making evidence-based clinical decisions. Evidence-based practice implies that clinicians use the best available research, based on this hierarchy, to guide clinical decision making.⁴⁰ It is believed that clinicians have a professional responsibility to know about the strength of available evidence relating to assessments and interventions, and to consider this when making decisions about patient management.²⁰

Table 1: Levels of Evidence according to Sackett et al^{41p 169}

Level of Evidence	Research Design
1a	Systematic review with homogeneity of RCTs
1b	Individual RCT with narrow confidence interval
2a	Systematic review (with homogeneity) of cohort studies
2b	Individual cohort study (including low quality RCT)
3a	Systematic review (with homogeneity) of case control studies
3b	Individual case control study
4	Case series and poor quality cohort and case-control studies
5	Expert opinion without explicit critical appraisal, or based on physiology, bench research, or “first principles”

One challenge for clinicians attempting to utilize the hierarchy of evidence has been the application of results from RCTs to physical therapy practice. One group of authors has suggested that physical therapists should only read and utilize RCTs when seeking out evidence for practice, and should disregard lower levels of evidence.¹³ However, there are inherent difficulties in applying evidence generated by RCTs to a clinical population.⁵ For example, the array of unique clinical circumstances a therapist treating a child with cerebral palsy must take into consideration is impressive. These include, but are not limited to, the child’s age, type of cerebral palsy, motor ability, cognitive ability, behavior and motivation, family involvement and support, home environment, and

educational placement. The results from highly controlled RCTs may not be directly applicable to an individual patient. Thus, the practitioner is required to make an interpretative “leap” in determining whether the results from any research, including RCTs, yields the best evidence to support a clinical decision.^{42, 43} As noted by Bithell, “...There is no intrinsic reason why a clinical experiment developed to prove pharmacological efficacy should be the best way to demonstrate effectiveness of therapies which depend so much on human interaction.”⁵ The concept of a hierarchy of evidence, as derived from medicine and pharmacologic investigations, may not always be applicable to the array of factors that influence physical therapy outcomes because of the variability inherent in the type of patients, patient-therapist interactions, and in the application of statistically significant results.^{5, 43}

Several other limitations related to the perceived “gold standard” of RCTs have been identified.^{5, 18, 27, 44-46} In physical therapy, RCTs are typically efficacy studies involving distinctly selected patient subgroups in university medical facilities. This information is not always relevant to “real-world” clinical practice.^{18, 27} In addition, the research procedures of randomly assigning patients to an experimental or control group, using standardized outcome measures that may not have real-world relevance, and the difficulty of blinding investigators and clients to the research procedures make RCTs difficult for physical therapists to implement, interpret, and utilize.^{18, 45}

Along with the methodological limitations, there is often a difference between an optimal and objective research outcome, and an optimal individual clinical outcome. Physical

therapy interventions are typically complex, long term, and influenced by a number of factors specifically related to each individual patient. Translating research results, even those results from high quality RCTs, into specific clinical decisions for an individual patient or client is challenging.^{10, 43, 45} Teasing out one aspect of a clinical intervention for study in isolation may lead to a “Type III error.”⁴⁷ This “error” is a non-standard research term and occurs when the interactive effects of an intervention are not considered.⁴⁷ The scientific method focuses on one variable at a time across a given number of identical research subjects to determine a single generalizeable outcome. Clinical practice deals with the consideration of countless variables at one time with one patient in order to generate a range of outcomes intended to satisfy that patient’s goals, needs and desires.⁴⁸ Often times, efficacious research regimens that work under ideal research conditions are not implemented if they do not address relevant clinical issues and cannot be applied to individual patients.^{10, 49, 50} A recent review of research and review articles in four national physical therapy journals during a 12-month time period identified a relatively small yield of articles containing scientific evidence that was both clinically useful and of high quality.³¹ An important and ongoing challenge for researchers is to generate clinically relevant findings that can be used to influence practice.^{10, 32, 51}

Challenge Number 2: Clinicians’ Skills

Evidence-based practice requires clinicians to read current research literature, understand research methodology, and incorporate best evidence into practice. However, many clinicians have difficulty accessing and interpreting the evidence that does exist.

Clinicians may lack essential skills relative to using technology to complete literature and

database searches.^{12, 35, 52} Many practitioners lack the skills that are necessary to understand statistical analyses and research processes.^{4, 12, 31, 34, 35, 52-56} Even if research evidence is available, it may be difficult to use in client-centered practice. The evidence that does exist may be conflicting or have methodological flaws.^{43, 54} Interpreting and implementing research evidence also requires clinical skill, judgment, and experience. Deciding what constitutes evidence that justifies a change in practice is not simple, and the opportunity for bias exists at every stage of the process.^{8, 43, 50} For example, some have suggested that the nature of scientific inference leads to an inevitable subjectivity in interpreting and implementing evidence.^{43, 57} Others have suggested that changing clinical practice to implement therapies that have not been sufficiently tested across a wide variety of settings in multi-center RCTs constitutes “evidence-tinged” practice and is inappropriate.⁵⁰ Interestingly, no definitive evidence has accumulated over some 15 years of research and debate on evidence-based practice to show that ‘practice using an evidence-based practice approach’ is superior to ‘practice as usual,’ or that patients who receive interventions from evidence based practitioners achieve superior outcomes when compared to those who do not.¹⁶

An often overlooked element of clinicians’ skills in evidence-based practice is that clinicians must critically evaluate their own individual practice.⁵⁸ Physical therapists should regularly question habituated and traditional practice and seek evidence to support clinical decision making.⁵⁹ Subsequently, practitioners must also critically reflect on the application of evidence-based interventions with each individual patient, and alter practice accordingly. Failure to consider all aspects of evidence-based practice, including

critical self-evaluation, during clinical decision making may lead to a decrease in effectiveness.^{59, 60}

Challenge Number 3: Logistical Considerations

A number of other logistical factors present challenges to clinicians who are attempting to use evidence to guide clinical decision making. Time constraints are almost universally identified as a primary limiting factor.^{11, 12, 35, 40, 52, 53, 61} Clinicians refer to pressures of today's health care environment and administrators' emphasis on productivity as factors that directly inhibit their ability to seek out, gather, read, and integrate scientific information relevant to daily practice.^{12, 35, 53-55, 61} Practitioners in settings not affiliated with teaching or research institutions often face challenges in accessing relevant scientific evidence into practice.⁵³

Clinicians also face difficulties in implementing changes in practice.^{12, 54} This may be due to resistance from other health care providers, including physicians and peers.^{34, 53-55, 62} Institutions may be reluctant to support changes, especially when financial considerations are involved.^{12, 34, 53, 62, 63} Evidence-based practice is not necessarily less expensive, and therefore changes in practice as a result of evidence-based practice may be met with some resistance.³

Interestingly, many of the barriers identified for the general population of physical therapists are especially relevant to pediatric practitioners, especially when compared to colleagues in other areas of practice. For example, 53% of pediatric physical therapists

have been in practice greater than 15 years, compared to only 38% of orthopedic physical therapists.⁶⁴ Individuals who have been in practice longer than 15 years are likely to be less familiar with online databases and less likely to have received formal training in critical appraisal of research than physical therapists who have been in practice for less than 15 years.¹² More than twice as many pediatric physical therapists as orthopedic physical therapists work part time.⁶⁴ Clinicians working part time are likely to have even greater time constraints than their full time counterparts and therefore have even less time for literature searches and article analyses. Finally, 49% of pediatric practitioners work in what may be considered more isolated settings such as a school system or a patient's home. In contrast, only 2.6% of orthopedic physical therapists work in these settings, and only 9% of physical therapists across all practice settings work in these areas.⁶⁴ As noted previously, practitioners in more isolated settings are likely to have increased difficulty accessing the research literature.¹²

In summary, the goal of evidence-based practice is to use the knowledge created by scientific research in physical therapy practice.¹⁰ However, this cannot happen without clinicians, as they are the interface. Promoting and developing a clinical "culture" for physical therapists that understands research, values the evidence generated by that research, and demands to be informed may yield more positive and efficacious outcomes. However, a number of challenges and barriers for pediatric physical therapists do exist. Clinicians are often unclear as to the definition of evidence-based practice, and they may not understand the types of research that produces high quality evidence.⁵³ Therapists often have difficulty applying research findings to individual patients and are unclear as

to whether high quality evidence exists to support or refute the use of therapeutic interventions.¹² Much of what physical therapists do awaits definitive research to establish its efficacy.⁸ In many instances, there is little evidence to support or refute current practices.⁸ Clinicians' negative attitudes about research further compound the difficulties for the implementation of evidence-based practice.¹⁷ Clearly, these challenges are substantial, since many clinicians do not know about the evidence, do not understand it, do not believe in it, or do not know how to apply the findings.⁸ Each of these challenges is especially pertinent to pediatric physical therapists, who are likely to be in practice longer and practicing in more isolated settings than their colleagues in other areas of physical therapy practice.⁶⁴

Purpose

It is critical that physical therapists aggressively pursue the development, implementation, and evaluation of processes that will cause them to effectively access and utilize research evidence to influence and guide practice. Physical therapists who work in pediatric clinical settings must respond to challenges that are perhaps unique to their specialty. There are three purposes to this dissertation research. The first purpose is to describe the current beliefs, attitudes, and practices of pediatric physical therapists toward evidence-based practice including how scientific research is used in their clinical decision making. Once the current beliefs, attitudes, and practices have been elucidated, this information will be used to accomplish the second purpose, which is the development and implementation of a therapist-centered process for integrating research evidence into pediatric physical therapy clinical decision making. The primary investigator will work with a targeted group of pediatric clinicians in a participatory, collaborative effort to

identify activities and strategies that are most likely to be effective in their unique clinical circumstances. These strategies will be aimed at enhancing the use of research evidence to aid in routine clinical decision making. The third purpose is to determine the effectiveness of these strategies and their impact, if any on the attitudes, beliefs and practices of these clinicians relative to evidence-based practice. Three hypotheses will provide the foundation for this research: The first hypothesis is that these pediatric practitioners will have a positive attitude toward evidence-based practice, but will possess a limited ability to use research evidence in clinical practice. The second hypothesis is that the pediatric practitioners will be able to identify numerous challenges and barriers that preclude them from utilizing evidence-based practice strategies as a means of supporting or enhancing clinical decision making. The third hypothesis is that through collaboration, effective strategies will be developed that address each practitioner's unique challenges and barriers and lead to improved use of research evidence to guide clinical practice. In addition, because this participatory process will lead to the most appropriate and effective intervention for each individual clinician, their beliefs, attitudes, and practices relating to evidence-based practice will improve.

The overall outcomes of this project will yield information concerning how and to what extent pediatric physical therapists access and use research evidence to influence their clinical decision making, and help to identify potential processes and strategies that are most likely to facilitate individual clinician improvement in this area.

Table 2: Operational definitions for important terms utilized in this project

Term	Operational Definition
Evidence-Based Practice:	The integration of individual clinical expertise, individual patient preferences and actions, clinical state and circumstances, and the best available external clinical evidence from systematic research in making decisions about the care of individual patients. ^{3,4,7,29}
Scientific Research Evidence	Knowledge developed through systematic inquiry and reported in peer-reviewed scientific journals
Diffusion of Innovations	The process through which an idea, practice, or object that is perceived as new is communicated through certain channels over time among members of a social system ²
Clinical Reasoning	The thought processes associated with a clinician’s examination and management of a patient or client. The goal of clinical reasoning in physical therapy is wise action, or the best clinical judgment in a specific context. ⁶⁵
Clinical Decision Making	The end product of clinical reasoning. ⁶⁵ The decision(s) made by practitioners during care of individual patients.
Expertise in Physical Therapy Practice	Five common dimensions: perception of the physical therapy profession, a multi-dimensional knowledge base, clinical reasoning, movement, and virtues. Within each dimension, specific elements have been recognized as evidence of expert practice. Some examples include a strong emphasis on the centrality of the patient and patient interaction as sources of knowledge, self monitoring and reflection, movement analysis through both visual and tactile assessment, a strong inner drive to learn and succeed, and an ethical expertise based on a mutual respect between the patient and therapist and an understanding of the patient’s life situation ^{66,67}
Knowledge Translation	The exchange, synthesis and ethically sound application of knowledge—within a complex system of interaction among researchers and users—to accelerate the capture of the benefits of research ⁶⁸
Transtheoretical Model of Behavior Change	Behavior change is a process that unfolds over time through a sequence of stages. Health behavior change involves progress through six stages: pre contemplation, contemplation, preparation, action, maintenance, and termination. ⁶⁹
Participatory Action Research	Participatory action research is a research paradigm based on the systematic study of a situation to produce new knowledge that is directly pertinent to the setting where the investigation takes place. The outcomes may also be relevant or transfer to other similar settings. ⁷⁰⁻⁷⁴ Participatory Action Research systematically investigates and resolves problems experienced by practitioners and their clients, examines the effectiveness of work practices, and develops methods to resolve problems. ⁷⁵ It is a collaborative approach to inquiry or investigation that provides people with the means to take systematic action to resolve specific problems. ⁷³⁻⁷⁵
Reflexive Journal	A diary in which the investigator, on a daily basis, or as needed, records a variety of information about self...and method. ^{76 p.327}

Peer Debriefers	A peer or colleague who is informed about but not significantly involved with the research. The peer debriefer meets with the researcher, to collaboratively make meaning, as well as pose questions regarding how it is that a researcher “knows” what it is he knows. This process attempts to push the researcher to another level of understanding because the researcher must make explicit what he may understand on a more tacit level. In addition, this activity functions as a sounding board to help the researcher step back or out of the research enough to more thoroughly understand what it is he is seeing and doing. ^{71 p.78}
Therapist-Centered Process	Mutually agreed upon strategies and outcomes centered around the practitioners’ ability to access and utilize scientific research evidence to aid in clinical decision making; generated by a collaborative effort between the primary investigator and the other participants
Pediatric Physical Therapists’ Attitudes	Manner, disposition, or feelings towards the construct of evidence-based practice as outlined above and toward the use of scientific research evidence to guide clinical decision making
Pediatric Physical Therapists’ Beliefs	Somewhat synonymous with “attitudes,” this refers to the ways in which these clinicians value the construct of evidence-based practice and of the use of scientific research evidence to guide clinical decision making as a part of their professional practice
Pediatric Physical Therapists’ Practices	The activities that these practitioners do and carry out on a regular basis in order to utilize the construct of evidence based practice and scientific research evidence to guide clinical decision making

Chapter 2: Literature Review

History and Evolution of Evidence-Based Practice in Physical Therapy

As a profession, physical therapy (PT) has been subject to decades of criticism for its scarcity of research on the interventions that are used routinely in practice.²³ Therapists have been criticized for not using the research that *is* available to inform their clinical decision making.²³ The profession has been perceived as one that bases its practice largely on anecdotal evidence and uses treatment techniques that have little scientific support.²³ This issue was identified as early as 1969 in a presidential address by Eugene Michels to the membership of the American Physical Therapy Association. Michels called on his fellow members to move away from practice based solely on the suggestions of colleagues or personal experience and toward practice based on scientific research.³⁸ The importance of generating and utilizing research evidence to guide physical therapy practice has been identified numerous times in the decades since Michels' address.^{19-21, 37, 46, 77-79}

Prior to the mid 1970s, there was little need for scientific research to support clinical decision-making as PT practice was largely directed by physicians.⁴⁸ However, during the late 1970s and 1980s, physical therapists began to assume more responsibility for clinical decision making and relied less on direction from physicians.⁴⁸ A wider scope of practice in PT has likely increased the possibility that practitioners will face clinical scenarios where they are unsure about the best course of action. Despite this increase in autonomy, a review of the literature in 1986 indicated that research information was not used routinely by human service professionals, including physical therapists.³⁷ Clinical

decision making tended to be based primarily on biological rationale, intuition, trial and error, and a blind clinging to what was traditionally fashionable.^{8, 48}

This trend continued well into the 1990s, as most physical therapists based practice decisions largely on anecdotal evidence and utilized treatment techniques with little scientific support.^{19, 25, 36-39} Studies published in 1997 and 1999 indicated that physical therapists relied more heavily on initial education and training when selecting treatment techniques.^{24, 25} Other prominent factors that influenced decision-making included attendance at special practice-related continuing education conferences, prior experience, and peer suggestions.^{24, 25, 61} Less than five percent of survey respondents indicated that they regularly used scientific evidence to guide practice.^{24, 25} Personal experience and “expert” opinion guided clinical decision making throughout the decade of the 1990s.^{24, 25, 33, 61, 80}

These reports contribute to a growing body of literature that maintains that physical therapists neither read nor use research evidence to inform their practice.²³ Perhaps in response to these assertions, the appeal for *evidence-based* physical therapy practice continues to gain momentum.^{9, 11, 27, 48, 52} Many physical therapy professional organizations have identified evidence-based practice as a priority.^{10, 34, 52, 81-84} Numerous authors have stated that physical therapists have a moral, professional, and ethical obligation as professionals to provide evidence based service and to move away from interventions based solely on anecdotal testimonies, expert opinion, or physiologic rationale.^{5, 8-10, 12, 17, 25, 27, 53, 85, 86}

The evolution of evidence-based practice in PT corresponds with an attempt by the profession to shift away from traditional models of practice in which uncertainty was seen as a failing. In these traditional models, individual expertise was afforded a high priority and expert clinicians were thought to be those who always “knew what to do,” not those who questioned what they do.¹¹ The early formulations of evidence-based practice in PT discouraged clinical decisions based on individual clinical expertise and physiologic rationale. However, subsequent iterations have emphasized that research evidence alone is not an adequate guide to action.⁴ As noted by Sackett et al, clinical expertise must be informed but cannot be replaced by evidence alone.³ Evidence-based practice in physical therapy is not recipe-based. It does not attempt to replace the collaboration between the clinician and an informed patient jointly making clinical decisions.⁸ Instead, it requires physical therapists to integrate individual clinical experience with the best available research evidence in day-to-day practice.⁸⁶ Practitioners must also consider the individual values and needs of the patient and the unique circumstances of the clinical environment. Scientific evidence should be used to inform this process, not replace it.^{8, 9, 11, 27, 30, 53} Evidence-based practice is now considered to be a process that leads to a specific decision for an individual patient and is predicated on a number of clinical judgments that are directly related to the expertise of the clinician.^{9, 11, 27, 40, 60} Physical therapists are encouraged to use research evidence in a systematic way, in conjunction with clinical judgment, to make clinical decisions.

Criticisms of Evidence-Based Practice

Despite this urgent and ongoing call for a move toward evidence-based practice, a number of criticisms have been voiced. First, there is an overriding concern that research is removed from the “real world.”⁷⁴ This is often referred to as the theory-practice gap, which manifests itself in several ways. For example, clinicians may not consider topics that have been researched and written by academicians to be relevant or may consider well-documented treatments to be too elaborate or impractical to implement in every-day clinical settings.^{5, 87} In addition, the long term outcomes of an intervention may not be known if adequate follow-up was not included in the original study design. And, if the outcomes are limited to impairment level measures, they will have little meaning in terms of the overall function of the patient.⁸⁸ Outcomes that reflect statistical significance may not have clinical relevance if the effect size is small, the patient sample is atypical, or the intervention is not feasible in the clinic environment.^{5, 48} Finally, statistical techniques are used to reduce and summarize the data generated in a study. As such, the variability within the sample may not be readily appreciated.^{5, 48} However in clinical practice, physical therapists encounter this variability on a daily basis through their interactions with many of their patients.

Second, there are criticisms that “evidence” will be unilaterally applied.^{43, 44} Several authors have criticized the term “evidence” and have implied that the processes advocated by proponents of evidence-based practice will dictate the “correct” way to treat patients in a way that is seemingly bereft of any bias or interpretation, in contrast to decisions made based on clinical experience or expertise.^{5, 16, 43, 44, 89} However, according to Karl Popper, “There are all kinds of sources of our knowledge; but none has

authority.”⁸⁹ All practitioners, regardless of whether they espouse to being evidence-based practitioners or not, must make inferences about the results of published work when attempting to apply research findings to their patients.^{16, 43} Medical hypotheses and research provide only conjectures about the truth. The results of any clinical trial do not deserve the title *evidence* in a purely objective sense, because the whole process of data analysis, presentation and interpretation contains many subjective elements.^{16, 89} It has been said that “...the long road between scientific work and the care of a patient is a road of uncertain interpretations, many of which are subjective in nature.”⁸⁹

The inferences, interpretations, and subjective elements inherent in clinical decision making are influenced by any number of factors including, but not limited to, the practitioner’s discipline, practice setting, patient population, and professional experience. As such, it is not realistic to expect that any evidence, regardless of the best efforts to categorize it according to a hierarchy relating to study quality or strength of methodology, will provide the “correct answer.” As long as inference is required to translate research to clinical practice, there will be no conclusive proof that any treatment plan is necessarily the best choice or the most appropriate for a particular patient.⁴³

A third criticism of evidence-based practice is related to the hierarchy that is used to classify the level of evidence generated by a particular study. Large randomized controlled trials (RCTs) and systematic reviews of RCTs are at the top of the hierarchy. In descending order are smaller RCTs (less than 100 subjects), cohort studies, single case designs, case reports, and finally expert opinion.³⁰ This approach to classifying research

evidence is based on a clinical-epidemiological interpretation of the relative strength of the methodology of a particular study.⁵

To date, determining the evidence for health care interventions has been achieved primarily through the more conventional quantitative techniques consistent with the biomedical scientific method and the evidence-based practice hierarchy.⁴⁵ The emphasis has been on generating high quality RCTs. However, there are number of limitations to this strategy. Randomized controlled trials are very amenable to studies investigating discrete and highly controlled variables. For example, this hierarchy of methodologies is well suited to the clinical testing of the efficacy of drugs.⁵ However, the factors underpinning patient performance in a rehabilitation context do not always lend themselves to the control inherent in large drug studies.^{5, 45, 90, 91} Physical therapy interventions, by nature, are often complex, long-term, and specifically related to the patient resuming functioning in his or her unique lifestyle and living conditions.⁴⁵ Additional factors, such as the expense and time investment required for RCTs, accessing and studying homogenous patient populations, and delivery of a pre-specified and invariable treatment or intervention to each patient, all make the implementation and utilization of RCTs in physical therapy problematic.¹⁸ Given all of these factors, it is not surprising that for many physical therapists, there are few high quality RCTs conducted in their area of practice, or that are relevant to their treatment population.^{5,13}

Proponents of evidence-based practice often state that a variety of research designs may contribute important information to clinical decision making. The importance of the

expert clinician in using the research evidence to practice is highlighted.^{11, 13, 14, 30}

However, these authors then contradict themselves by over-emphasizing the research hierarchy, which relegates expert opinion and scientific research other than RCTs to the lower levels of the evidence hierarchy. In some cases, readers are discouraged from reading anything other than RCTs.^{11, 13, 14, 30}

The existing hierarchy and levels of evidence are also problematic due to the minimization of the importance of qualitative research, a research paradigm that is becoming increasingly prevalent in physical therapy.^{18, 45, 48, 91} Qualitative research involves describing and explaining complex social phenomena that occur in natural settings. In contrast to the quantitative approach, qualitative methods are used to access and analyze complex or abstract phenomena and relationships, as well as to systematically address the kinds of questions that are not easily addressed by quantitative methods. While qualitative research is appropriate for the investigation of many of the clinical issues faced by physical therapists, the hierarchy of evidence classifies this research in the lowest category.

A fourth criticism of evidence-based practice pertains to the difficulty in measuring the combined effects of several interventions that may be used with any given patient. In clinical practice, a number of physical therapy interventions are typically combined in order to optimize the outcome for an individual patient. This concern is analogous to combining drug therapies in medicine. The difficulties in investigating combined interventions are illustrated in the following example: currently there are seven classes of

drugs identified that may slow the progression of Alzheimer Disease. According to best evidence-based practice methods, to adequately investigate combination treatments of these drugs, it would take 128 clinical trials, 63,500 patients, and over 300 years.¹⁴

⁹²Physical therapy researchers attempting to investigate the multitude of combination therapies inherent in “real world” clinical practice are faced with the same daunting factors. In addition, even if there were enough time and subjects available, physical therapy questions currently do not receive the funding or have the prerequisite background information to justify large scale, population based studies.¹⁴

A fifth criticism of evidence-based practice is the impact of publication bias on clinical decision making. Research that is published is more likely to reflect positive results. In addition, publication is more likely if effects are large and statistically significant. Preferential publication of studies with significant and positive results is problematic, because it means that readers of clinical trials see an unrepresentatively positive subset of trials. As a consequence, readers may be inclined to form unrealistically optimistic opinions of the effects of interventions.¹³ Similar concerns arise due to the fact that a number of key features of RCTs have been shown to affect the validity of results. Studies that do not include these key features, such as blinding of assessors or patients and concealed method of subject allocation will tend to show a greater effect of the intervention. The typical randomized trial in physical therapy is unlikely to include many of these key features and, as such, is potentially biased toward demonstrating a positive effect.¹³

Finally, as logical as the premise of evidence-based practice may seem, to date there is no empirical evidence to support the notion that the patients of practitioners who utilize this approach have better outcomes than those of practitioners who utilize a more traditional approach to patient care.¹⁶ This is interesting, and somewhat contradictory, given the evidence-based practice proponents' strong emphasis on basing clinical decisions on evidence and avoiding reliance on expert opinion. To date, the only "evidence" that supports the evidence-based practice approach is expert opinion.¹⁶

Despite these criticisms, the move toward evidence-based practice in physical therapy continues to be inexorable. The profession is compelled on a number of levels to move toward practice that is grounded in scientific research and that utilizes evidence to guide decision making. This movement is a moral and ethical obligation, a professional responsibility, and a requirement for continued reimbursement from third party payers. The profession must continue to build a strong scientific foundation. However, equally importantly, it must also develop and implement strategies that optimize the ability of practitioners to access, acquire, understand, and apply information from the scientific literature on a routine, daily basis. Ultimately this should lead to the best outcomes for the patients receiving physical therapy services.

Clinical Reasoning and Decision Making in Physical Therapy

Clinical reasoning refers to the thought processes associated with a clinician's examination and management of a patient or client. The goal of clinical reasoning in physical therapy is wise action, or the best clinical judgment in a specific context.⁶⁵ High

level clinical reasoning involves the integration of research evidence, professional expertise, and client-centered care in every-day decision making.⁶⁵ Early research in clinical reasoning focused heavily on the general strategies utilized by practitioners. The emphasis was on attempting to analyze the behaviors (and steps) involved in problem solving.⁶⁵ The strategies were thought to easily transfer from one domain to another.⁹³ This hypothetico-deductive reasoning model emerged fairly early and was grounded in medical research and practice. The emphasis of this model was on arriving at an accurate diagnosis. To this end, a minimum number of hypotheses or problem formulations are generated very early in the diagnostic process, and these guided subsequent data collection. This occurs even with a very limited initial data set (e.g. a small amount of information from the patient).^{93, 94} The generation of hypotheses is thought to be a psychological necessity, given the complexity of the clinical situation, the enormous amount of data potentially obtainable, and the limited capacity of working memory.⁹³ This hypothesis-generation process has been identified in novices and in experienced practitioners who are faced with problematic or unfamiliar cases. The main difference between groups is that experienced practitioners encounter unfamiliar cases less frequently due to a superior domain specific knowledge base.⁹³

Two characteristics, 'forward reasoning' and 'backward reasoning,' are related to the hypothetico-deductive approach.⁹⁵ Forward reasoning involves applying a small set of if/then production rules to a problem to move from data to diagnosis without generating any hypotheses. To generate and apply production rules, the clinician draws from his structured knowledge base. As the familiarity and comfort level with a particular case

scenario increases, the more likely the practitioner will be to employ a forward reasoning approach.^{93, 95, 96} This notion of “pattern recognition” through forward reasoning is based on both experience and knowledge and viewed as a perceptual ability to recognize relationships among the components of a particular situation. This method is more common in experienced practitioners.⁹⁷ Backward reasoning, in contrast, has been described as the re-interpretation of data or the acquisition of new clarifying data to test a hypothesis. Information is continually gathered in an effort to confirm or discard hypotheses. This method has been described as a less sophisticated or efficient process as irrelevant or inappropriate data may be gathered.⁶⁵

Recent research in the health sciences has demonstrated that clinical reasoning is not a separate skill that can be developed in the absence of relevant professional knowledge. There is increasing evidence to support the importance of domain-specific knowledge and an organized knowledge base in clinical problem solving.^{93, 95, 96, 98, 99} It has been demonstrated that the amount of information gathered varies inversely with the experience of the subject.⁹⁴ Therefore, current research has shifted away from the strategies of clinical reasoning to the structure of clinical knowledge, how it is organized, and how it is accessed.⁹³ Sophisticated clinical reasoning is distinguished by the depth and quality of the problem-solver’s knowledge base and in the ability to use that knowledge base to make inferences from clinical data.⁹⁵ The structure of and access to the knowledge base, rather than the strategy employed, is thought to be the key to optimum clinical reasoning.⁹⁵

More recent research in physical therapy, occupational therapy, and nursing, has challenged the empirico-research paradigm and the tendency to rely heavily on rules and causal laws that may be more appropriate to the natural sciences.⁶⁵ Instead, the human sciences promote a view of knowledge that accords validity to both propositional (scientific) and non-propositional (professional craft and personal) knowledge.⁶⁵ For example, in occupational therapy, clinical reasoning is thought to include the complex thought processes that are used during all therapeutic interactions, to integrate client assessment information and formulate an intervention plan. This interpretation of clinical reasoning encompasses a combination of technical skills and personal and professional knowledge, all of which enable the practitioner to perceive clients from a broad, holistic perspective.⁹⁷ Within this paradigm, the reasoning process is divided into five different categories, including diagnostic, procedural, interactive, conditional, and narrative reasoning. Each of these reasoning “tracks” is used simultaneously and interchangeably depending on the nature of the clinical situation. For example, diagnostic and procedural reasoning correspond most closely to the medical/diagnostic models described above, with an emphasis on hypothesis generation and pattern recognition. The focus is on cue acquisition, hypothesis generation, refinement, and verification, leading to an occupational therapy diagnosis, or a clear and accurate description of the client’s occupational performance.^{97, 100, 101}

An important contrast between the processes used by occupational therapists and those used by physicians is the almost automatic and dynamic interplay between diagnosis and

treatment selection.¹⁰⁰⁻¹⁰² Thus the remaining clinical reasoning tracks focus more heavily on non-propositional knowledge. Interactive reasoning is used to help the therapist interact and better understand the client and the impact that the disease or disability has on the client. Narrative reasoning is utilized as the therapist helps the client participate in the difficult process of reconstructing his life following a permanent change due to an injury or illness. It is a primary way of making sense of the human experience and is used when trying to understand another person's experience. It attempts to link the outside world with the inner world of intention and motivation.⁹⁷ Conditional reasoning is used to integrate the other types of reasoning, as well as to project an imagined future condition or situation for the patient.¹⁰¹ Thus, occupational therapists appear to use the general strategy of diagnosis, prognosis and treatment in order to find out details of the person's unique situation and to determine the action the therapist or client might take that would result in increased function. Clinical reasoning is an ongoing, dynamic process, not just limited to the diagnostic phase, but integrated throughout the entire client-therapist interaction.¹⁰²

The goal of clinical reasoning in physical therapy, as in other health professions, is to make the best judgment in a specific context.⁶⁵ Reasoning can be thought of as an internal dialogue that occurs before, during, and after patient care. Reasoning can be formalized into general problem solving strategies, as well as an individualized, contextualized, and sometimes even unknown or unconscious process.¹⁰³ Initial research in physical therapy found that clinicians use many of the same reasoning processes employed by physicians, such as hypothesis generation and pattern recognition.¹⁰⁴ Based on a variety of cues, and

dependent on the setting, the physical therapist generates a range of impressions or working interpretations during patient/client interactions. These initial hypotheses may be physical, psychological, or socially related, with or without a “diagnostic” implication.⁶⁵

Physical therapists have been shown to go beyond a diagnostic process to include reasoning focused on intervention.¹⁰⁵ The *Guide to Physical Therapist Practice* uses the disablement model as a framework for understanding practice and for optimizing function.¹⁰⁶ The key elements of the framework represent components of patient/client management that include examination, evaluation, diagnosis, prognosis, and intervention, all of which focus the practice of physical therapy on the process of disablement and the impact of conditions on patient function rather than on disease or diagnosis.¹⁰³

Qualitative research in pediatric physical therapy has also illustrated the importance of the interaction and collaboration between therapist and patient and family in the clinical reasoning process. Factors involved in the decision making process include movement assessment and observation, psychosocial sensitivity, procedural changes, and self-monitoring and reflection. Clinical reasoning is centered on collaborative problem solving between the patient and the therapist. The diagnostic process is not emphasized as a central aspect of patient management. Here, the clinical reasoning process is not as analytical, deductive, and rational as portrayed in other clinical reasoning models.

Knowing the patient, understanding his story, integrating the patient’s story with clinical knowledge, and then collaborating with the patient to problem solve are central components of clinical reasoning in physical therapy.^{66, 103, 105, 107} Interestingly, practice

decisions are not always apparent as rational thought processes.¹⁰⁸ The knowledge that guides judgment and action is often reflected in implicit thought processes that are translated into habitual ways of observing and interacting with patients.¹⁰⁹

Clinical Reasoning and Evidence-Based Practice

With its emphasis on the conscientious use of “best” evidence, often defined as high quality RCTs, to guide clinical decision making, evidence-based practice may seem incompatible with optimal clinical reasoning for physical therapists. Clinicians may question the validity of practice being guided solely by scientifically generated knowledge. While empirico-analytic research and the scientific method provide a means of generating knowledge, a broader definition of knowledge/evidence is needed when that knowledge is to be used in the assessment and management of clients whose problems can rarely be reduced to precise categorization or prescriptive management. To address the spectrum of patients’ needs, the value of non-propositional knowledge, such as professional craft knowledge amassed through clinical experience, must be acknowledged.⁶⁵

Here, the definition of evidence is broadened to include knowledge from a variety of sources that has been subjected to testing and has been found to be credible. Knowledge used to guide clinical decision making should be contextual.⁶⁵ Further, once a management strategy has been supported by external evidence, skilled reasoning is required to transfer the information to individual patients.⁶⁵ Reasoning is needed to evaluate the quality of the evidence, to apply evidence to specific situations, and to function in situations where there is limited evidence to guide practice.⁶⁵ Physical

therapists attempt to continually negotiate a balance that reflects practice that is guided by a combination of implicit knowledge, scientific evidence, expert opinion and/or personal experience.

Expert Practice in Physical Therapy

Defining the concepts of expertise and expert practice is an ongoing challenge for professionals. Students, teachers, practitioners, and patients have a strong vested interest in defining expert practice and determining how expertise is attained. The qualities experts possess, the behaviors they demonstrate, and the path to attaining these attributes are of critical importance to the growth and development of a profession.⁶⁶ A challenging aspect of defining expert practice lies in establishing the criteria used to identify experts. Once the criteria are established, “experts” may be studied in a variety of ways. Gathering this information and establishing its relationship to ongoing practice, integrating it into contemporary views on expert practice, and identifying future areas for investigation, fosters the ongoing growth of the profession.

Defining the Expert

One of the most difficult challenges in addressing this issue is determining what constitutes expert practice and who qualifies as an “expert.” Excellent performers are often easily recognizable, but it may be difficult to establish specific criteria or characteristics that distinguish an expert from a non-expert.¹¹⁰ Intuitively, appropriate criteria for the “expert” designation should include the practitioner’s outcomes of practice. For example, if a physical therapist is significantly more successful than his/her colleagues in achieving accurate diagnoses and/or optimal patient and family outcomes, one may argue that he/she is in fact an expert. Although this outcome does not take into

account other dimensions of practice, such as administration, professional service, and research, the outcomes of the patients receiving expert intervention, when compared to novice or less skilled intervention, would seem to be an accurate barometer of “expert practice.”¹¹¹

Unfortunately, to date, there has been minimal investigation into the use of outcomes data to define expert physical therapists. Research in this area indicates that experts are typically identified through some combination of criteria including nomination by fellow practitioners, years of experience, and amount of formal education. While the identification of true experts is essential to research in this area, there is no consistent rationale for the approaches utilized in naming practitioners as experts. The amount of experience and education required tends to vary widely.¹¹² Thus far, most investigations into expert practice in physical therapy have used peer designation/ nomination as the means to identifying experts.^{67, 104, 113} There are limitations with this approach, however. For example, peer nomination may lead to the identification of colleagues remarkable for their popularity, kindness, extroversion, or some other set of characteristics that distinguishes them from other practitioners, none of which relates directly to expert practice. In addition, experience on its own does not result in the development of expertise.^{111, 112} Ideally, a number of factors, including clinical outcomes, peer recognition, experience, and amount and type of education should be considered in order to best identify experts. There is a need to establish clear and consistent criteria in each of these domains so that the expert can be more readily identified and studied.

Historical and Contemporary Views on Expertise

The theory of expertise and expert practice has undergone an interesting evolution with a gradual shift away from a description of specific problem solving techniques employed by experts and instead moving toward how experts think.⁶⁶ This somewhat parallels the evolution of clinical reasoning in professional practice. The first generation of theories on expertise focused on heuristics and problem solving skills or techniques utilized by experts, regardless of content or domain. The second generation moved toward a greater emphasis on domain specific knowledge, including some combination of declarative and procedural knowledge. Due to highly organized knowledge, extensive experience, and thoughtful reflection, the expert was deemed much more adept at solving problems quickly and efficiently by employing the use of “forward reasoning” and pattern recognition.¹¹⁴ Experts were thought to possess specific knowledge and understand how that knowledge should be organized.⁹⁵ A third generation of theories on expertise has been advocated as a result of the inconsistencies and limitations of the earlier theories. This theory has been developed in conjunction with an emphasis on studying experts within practice environments rather than in artificial or research settings. Research investigates the process of reasoning and seeks to understand the structure and use of knowledge during actual clinical practice. This approach facilitates the development of theories of expertise from an inductive or grounded theory approach by collecting information and identifying emerging trends and ideas.⁶⁷

The grounded theory approach has been utilized to study the dimensions of clinical expertise in physical therapy practice across four clinical specialty areas: geriatrics, neurology, pediatrics, and orthopedics.⁶⁷ Although the authors do acknowledge some

possible differences in cognitive processing styles among the different clinical specialty areas, five common dimensions of physical therapy expertise have been identified: conception of the physical therapy profession, a multi-dimensional knowledge base, clinical reasoning, movement, and virtues.⁶⁷ Within each dimension, specific elements have been recognized as evidence of expert practice. Some examples include a strong emphasis on the centrality of the patient and patient interaction as sources of knowledge, self monitoring and reflection, movement analysis through both visual and tactile assessment, a strong inner drive to learn and succeed, and an ethical expertise based on a mutual respect between the patient and therapist and an understanding of the patient's life situation.⁶⁷

Bloom's Taxonomy has been utilized as a framework to describe why experts in neurologic physical therapy are "faster and more efficient" than novice practitioners.¹¹⁵ The taxonomy consists of a hierarchical classification of six elements: knowledge, comprehension, application, analysis, synthesis, and evaluation. These elements are sequential and build upon one another. Therefore, expert practitioners function toward the analysis/ synthesis/evaluation aspect of the taxonomy, and novices function at the knowledge/comprehension/application level. Novices tend to focus on collecting factual details without regard to other aspects of the client's clinical presentation while experts focus on integrating a variety of patient-related information during the evaluation process.¹¹⁵

Many of these same themes have emerged in the study of expertise in other professions. Expert nursing practice has been characterized as non-rule governed practice, with heavy reliance on intuition and salience.¹¹⁶ Some characteristics of expert nurses included the ability to utilize intuitive links between the salient issues in the situation and ways of responding to them, practical reasoning with a mature grasp of distinctions and commonalities in particular situations, and “fluid and seamless” performance. Interestingly, nursing experts were further differentiated into such categories as “technologists” and “humanistic existentialists.”¹¹⁶

Finally, interviews and observation of an experienced and novice occupational therapist led to a description of emerging themes relating to expert practice . This included evidence of clinical reasoning, an ability to prioritize, and special attention to the role of the patient and patient interaction during practice. Each of these elements was identified as an important difference between experienced and novice practitioners.¹¹⁷

Expert Practice in Physical Therapy: Current state of affairs

In a recent effort to consider patient outcomes in the study of expertise, Resnik & Jensen utilized clinical outcomes to explore the theory of expert practice in physical therapy.¹¹¹The authors accessed data on outcomes of patients with lumbar spine syndrome. In a retrospective analysis of these data, therapist expertise was operationally defined on the basis of collective patient outcomes. Discharge scores were calculated and compared once the effects of a variety of patient factors were taken into consideration. Therapists in the expert group had the highest mean patient outcome scores while

therapists in a comparison, or “average,” group had mean scores in the 45th-55th percentile. Subsequently, the authors utilized a multiple case study design to gather information about the expert practitioners and to build upon the grounded theory of expert practice in physical therapy.¹¹¹

Based on this and other investigations, a number of key factors relating to expert practice, identified across professions and integrated into the practice of physical therapy, have emerged.^{66, 67, 107, 111, 115-119} Experts bring more knowledge to bear. Their knowledge is multi-dimensional and is obtained via traditional processes, such as reading scientific journals and evidence, attending selected continuing education, and obtaining more formal university level degrees beyond the entry level.^{66, 67, 111, 118} This knowledge is highly organized, accessible, and integrated.^{66, 67, 107, 111} In addition to declarative knowledge, practical, procedural, or intuitive knowledge are also apparent; this is often referred to as the “art” of therapy.^{66, 67, 107, 111, 116} These dimensions tend to exist at a more sub-conscious or implicit level. Experts utilize this implicit and explicit knowledge base to formulate schemata relating to differing aspects of clinical practice. These underlying cognitive structures aid in organizing and categorizing such things as movement dysfunction, client behaviors, and client learning and interaction styles. Experts develop and organize a large amount of schemata, which leads to more efficient and effective clinical practice.^{66, 107}

Experts appear to identify and solve problems more quickly and efficiently and monitor, adapt, and revise approaches to problems with ease.^{66, 67, 107} In part, this is a function of

the vast array of schemata available to the expert. The schemata allow for a more targeted and focused examination process, and subsequently a more accurate set of ongoing working diagnoses. Because these are more accurate, and patient/family interactions are more optimal, intervention programs are likely to be more successful. In addition, since expert practitioners have more schemata to draw upon, they are more likely to alter and adapt a particular approach when appropriate, increasing the likelihood of a more optimal outcome.^{66, 67, 107}

Experts appear to continue to learn through experience by monitoring actions and evaluating ongoing efforts at problem solving. This includes both reflection in- and reflection on- action, or mindful practice, which allows practitioners to attend, in a non-judgmental way, to their physical and mental processes.¹¹⁹ Critical self reflection enables the practitioner to listen attentively to patients' communication, recognize errors, refine technical skills, make evidence-based decisions, and clarify values so that they can act with compassion, technical competence, presence, and insight.¹¹⁹ Again, as schemata are established and increase in number, the process of self monitoring and reflection becomes more effective.^{66, 67, 107, 111, 119}

Experts appear to continually develop skills through intense, focused, and deliberative practice. In pediatric physical therapy, for example, a combination of tactile and visual analysis of movement leads to the development of movement scripts. Hands-on, or psychomotor skills, are an essential component of practice. Practicing these skills in a

mindful, attentive way leads to more detailed and accurate scripts and more effective and successful practice.¹⁰⁷

Experts seem to be especially insightful and investigate not only the stated problem, but also the context and extraneous factors that may affect the problem. Experts tend to exhibit greater psychosocial sensitivity and more consistent social responsiveness. The expert consistently displays a respectful, caring, committed attitude that is conveyed during all patient and professional interactions. The tendency is for experts to focus on disability type issues and aid the client and family in “real-world” problem solving. There is a reduced emphasis on addressing impairment-based issues, such as strength or muscle tone, isolated from and out of context for the client and family.^{67, 107, 111}

There is a great deal more to learn about the concept of expertise and expert practice as it relates to the profession of physical therapy. First, and most importantly, much work needs to be done in developing a valid definition of an expert practitioner in this field. An important component is the patient care outcomes experts achieve compared to less skilled practitioners. The objective measure of outcomes at various dimensions of the enablement/disablement model followed by comparisons across practitioners is a means of identifying expert practitioners. By combining this outcomes-based information with criteria, such as years of experience and peer nomination, a more comprehensive and accurate picture of expertise is likely to emerge.

Once experts are identified, other factors regarding expert practice may be investigated further. For instance, the role experience plays, and how this experience should be structured, is important information to aid practitioners who strive to become experts. As noted above, experts practice frequently and intensively. Some literature on expertise indicates that 10 years of practice and the accumulation of approximately 50,000 “chunks” of information are essential to the development of expertise.¹²⁰ Therefore the structure of professional education, clinical education, and clinical practice must be studied so that the accumulation of these chunks of information is fostered in an optimal fashion. Another important question is how experts use scientific evidence to guide and inform practice.

A number of themes have emerged that may serve as guidelines for expert clinical practice in physical therapy and may be used to guide future generations of physical therapists along this path. Expert physical therapists must possess a combination of high-level knowledge, advanced judgment, skilled movement analysis, and virtue. Their knowledge base is multi-dimensional and includes both traditional declarative learning processes along with procedural, practice-based knowledge. Advanced judgment leads to optimal interaction with the patient and family and the ability to monitor, adapt, and alter intervention strategies when appropriate. Extensive and detailed movement scripts foster the ability to analyze movement quickly and to accurately diagnose movement dysfunction, leading to more targeted and effective treatment regimens. Finally, virtue emphasizes a respectful, caring, committed attitude that is continually conveyed during all professional interactions. Building on this foundation, and investigating this issue in

greater detail, should serve to foster the ongoing growth and development of this profession and, most importantly, to optimize the outcomes for the patients and families receiving physical therapy services.^{66, 67, 107, 111}

Knowledge Translation

In health care, there is a large gap between what is “known” and what is practiced. As stated in the Institute of Medicine report *Crossing the Quality Chasm*, “Between the health care we have and the care we could have lies not just a gap but a chasm.”¹²¹

Recent research has shown that health care delivered in industrialized nations often falls short of optimal, evidence-based care.^{122, 123} One example is the widespread variation in the use of aspirin, calcium antagonists, beta blockers, and anti-ischemic drugs in the management of cardiovascular disease, despite good evidence on their best use.¹²⁴ US adults receive only about half of recommended care, and the US Institute of Medicine has estimated that up to 98,000 US residents die each year as the result of preventable medical errors.^{122, 123} Americans spend almost 40% more per capita for health care than any other country, and yet the US ranks 27th in infant mortality, 27th in life expectancy, and US citizens are less satisfied with their care than are the English, Canadians, or Germans.¹²⁵ Therefore there is a need to transfer research and information from those who generate it to users and service providers in a form that has direct and immediate application and that is likely to improve practice. Recently, there has been an increased focus on the issues surrounding how knowledge generated by scientific research gets disseminated and translated into clinical practice.

Knowledge translation has been defined as the exchange, synthesis and ethically sound application of knowledge—within a complex system of interaction among researchers and users—to accelerate the capture of the benefits of research...through improved health, more effective services and products, and a strengthened health care system.⁶⁸

Knowledge translation can be seen as analogous to a regional power grid, in which generating plants from different localities contribute electricity at a great intensity. The high intensity is necessary to increase efficiency- to minimize energy loss for conveyance along power lines over long distances. But then the electricity must be “stepped down” to a more manageable, household voltage before it can be used. Similarly, highly complex technical research information must first be integrated and then “stepped down” for communication to different audiences and then used in the most appropriate ways.¹²⁶ A considerable amount of research has been done in the area of knowledge translation. The information provided in this section of the literature review will focus on aspects of knowledge translation that relate directly to physical therapy.

The dissemination of research information has been influenced by several factors. One important barrier, for example, is the enormous volume of research literature that exists and continues to expand. There are approximately 30,000 biomedical journals being published each year, and one estimate is that decision makers need to read on average 19 articles each day to keep abreast of their field.¹²⁷ Other barriers include time, access, complexity of the literature base, and applicability of research to clinical practice. Additional issues related to knowledge translation include an emphasis on disseminating research but not on using that research, and a “top-down” research to practice focus

rather than a “bottom-up” problem solving focus.¹²⁸ In fact, some authors have argued that a distinction needs to be made between ‘dissemination’ and ‘effective dissemination.’ Other important factors that influence knowledge translation include factors that positively or negatively influence individual behavior change, organizational or system wide change, and the diffusion of innovations. Finally, the strategies that are employed to support knowledge translation must include a consideration of the needs of and constraints on the practitioner during the daily routine. Having information does not necessarily mean that it will be utilized, and factors that impact on the utilization of knowledge must also be considered.¹²⁹

Knowledge and Knowledge Utilization

How do individuals utilize knowledge? Some researchers have distinguished between conceptual and instrumental use of knowledge.(Table 3) A conceptual use of knowledge is a change in level of knowledge, understanding, or attitude. Instrumental use of knowledge is a change in behavior and practice, acting in specific and direct ways to solve a problem. An additional consideration is the strategic or symbolic use of knowledge, which implies the manipulation of knowledge to justify a position or to attain specific power or profit goals.^{130, 131} Others have categorized knowledge into explicit, clinical, and tacit frameworks.(Table 4) Explicit knowledge is generated through scientific studies and is disseminated through peer reviewed journals and textbooks. It is commonly expressed and utilized as clinical practice guidelines. Clinical knowledge is gathered during clinical encounters with patients and is part of the examination process in physical therapy. Tacit knowledge is generated through the sum of past experiences and is likely to profoundly influence each new clinical encounter.¹³²

	Table 3: Categorization of Knowledge Usage
Conceptual	Leads to a change in knowledge, understanding, or attitude
Instrumental	Change in behavior and practice, acting in specific and direct ways to solve a problem at hand
Strategic	Justify a position or to attain specific power or profit goals

	Table 4: Categorization of Knowledge Generation
Explicit	Generated through scientific studies; disseminated in peer reviewed journals and textbooks
Clinical	Gathered during clinical encounters; component of examination process in physical therapy
Tacit	Generated through sum of past experiences

The complexities and the dynamic, transactional aspects of knowledge utilization have become more widely recognized. The knowledge “user” is now thought to act upon information by relating it to existing knowledge, imposing meaning and organization on experience, and in many cases, monitoring understanding throughout the process. This casts the user as an active problem-solver and a constructor of his or her own knowledge, rather than as a more passive receptacle of information and expertise.¹³³ With this view, knowledge is not an inert object to be “sent” and “received,” but a fluid set of understandings shaped by those who originate it and by those who use it. Knowledge use, then, is conceived as an active learning process.¹³¹

The instrumental use of knowledge during clinical practice problem-solving, for example, is highly complex and determined by a variety of factors including past experiences, beliefs, values, skills, resources, legislation, protocols, patient preferences, and the results of research. Ultimately, the goal of effective knowledge translation is to move toward the instrumental use of knowledge generated from scientific research as a consistent element

of clinical problem solving. An effort must be made not only to help the practitioners acquire the knowledge, but also to guide the instrumental use of that knowledge.

Individuals translate knowledge through the lens of prior knowledge and understanding, making sense of new knowledge in the context of their daily activities. What is “adequate” translation for any one individual, or organization to change behavior is likely to vary. The user’s self-interest and self-image sometimes include factors that conflict with what may, in terms of efficiency, cost benefits, or effectiveness, appear to be the “best” solution. Telling people that their ideas or practices are wrong, or ineffective, or outdated, is generally an inadequate approach to encouraging change.¹³¹ In order to take on a new viewpoint, one must decide to let go of an existing viewpoint. There must be a reason to decide to make a shift in thinking.¹³¹

There are generally thought to be four major elements of knowledge translation and utilization: the dissemination source, which in physical therapy would be the clinical or basic researcher; the content or message; the dissemination medium; and the user, or intended user of the information. (Table 5) A major criticism of disability research is the often distant relationship between researcher and potential users of their research results. In addition, researchers, in the process of disseminating their results, will operate within the guidelines of their values and assumptions, which may differ from the values and assumptions of their potential users. By explicitly stating how their values and assumptions potentially influence their results, researchers provide the opportunity to interpret and use results in ways that make the most sense to users.¹³¹ In addition, the

source of the information disseminated is generally more important to users than the content of the information. Users tend to accept assistance, information, and ideas from sources they know and trust.^{131, 133} Additional factors include the credibility and trustworthiness of the information source, along with the intensity of the feelings toward the information being disseminated.¹³¹

With regard to the message, or content to be disseminated, the assumption that the quality of the research results influences utilization has been called into question by some researchers. It appears that poorly conceived and executed studies are viewed as positively by users as are well-designed studies. The authors speculate that this is due to an underinvestment in dissemination work by the researchers utilizing stronger research designs.¹³⁴ Interestingly, if the research conforms to the expectations of the user, it does not need to be high in quality. However, if the information is counter-intuitive to the user, then research quality is more important.¹³⁵ Therefore the information must be compatible with the users' beliefs, and it must be easily comprehended, reinforcing the notion of "two communities," researchers and practitioners, who are likely to utilize a different language and have differing values and belief systems.¹³¹

The dissemination medium is often difficult to distinguish from the content of the message. Thus, the vehicle selected to convey the message may enhance or detract from that message.¹³⁶ Selection of this media for particular content or audience is a complex and challenging task.¹³¹ The media and formats available for dissemination are increasing rapidly with new technological development. However, individuals must be able to

access and utilize these media, and the evidence continues to suggest that frequent personal interaction is the most effective dissemination medium.^{131, 137} Multi-faceted approaches to communication are also required. Single approaches at low levels of intensity are not likely to be effective.¹³¹

The intended users are perhaps the most critical element of the dissemination process. The materials to be disseminated must address the context and concerns of a potential user's daily life. The most effective way to address this requirement is to involve potential users of research information from the beginning of the research project, with ongoing and substantial interaction between researchers and users.¹³¹ It is also critical that the dissemination process take into account the users' "readiness for change." Efforts aimed at creating change must include active interventions to deal with human dynamics and that attempt to overcome resistance, fears, and anxieties about change.¹³¹ Involving user audiences in setting research agendas and conducting research and development activities can also help to address issues related to readiness to change. Personal and organizational incentives may also influence potential users to change, with personal or internal incentives likely to be more powerful.¹³¹ See Table 5 for a summary of the important issues relating to each of the elements relating to effective knowledge dissemination.¹³¹

Table 5: Elements and Issues Related to the Knowledge Utilization Process

Elements of Dissemination	Issues in Effective Dissemination
Source	<ul style="list-style-type: none"> • Perceived competence • Credibility of experience • Credibility of motive • Sensitivity to user concerns • Relationship to other sources trusted by users • Orientation toward dissemination and knowledge use
Content	<ul style="list-style-type: none"> • Credibility of research and development methodology • Credibility of outcomes • Comprehensiveness of outcomes • Utility and relevance for users • Capacity to be described in terms understandable to users
Medium	<ul style="list-style-type: none"> • Physical capacity to reach intended users • Timelines of access • Accessibility and ease of use; user friendliness • Flexibility • Reliability • Credibility • Cost effectiveness • Clarity and attractiveness of the information “package”
User	<ul style="list-style-type: none"> • Perceived relevance to own needs • User’s readiness to change • Information sources trusted • Format and level of information needed • Level of contextual information needed • Dissemination media preferred • Capacity to use information or product (resources, skills, and support)

Adapted from: A review of the literature on dissemination and knowledge utilization. In: (NCDDR) Southwest Educational Development Laboratory; 1996:1-37¹³¹

How Does Behavior Change?

An important aspect of knowledge translation is behavior change, both from an organizational perspective and at an individual level. Behavior change is complex, with many interacting influences including personal characteristics, the practice environment, and the local community.⁶⁰ The goal of knowledge translation is the application of new knowledge, or the instrumental use of knowledge through behavior change in the user.⁶⁸ This change is rarely a linear process that proceeds logically from dissemination to alterations in behavior with subsequent improved outcomes. Instead, it is much more likely to be dynamic, iterative, non linear, and emergent.¹³⁸

Factors that influence change include the organizational context, the intended outcomes of the change in behavior, the mechanisms that impact on the outcomes, and the contingencies upon which successful change depends.¹³⁹ Successful change is contingent upon mechanisms within a specific organizational context and what works in one context may fail in another. Successful implementation of a change in behavior is a function of the relation between the evidence or knowledge driving the change, the organizational context, and the mechanisms for facilitating the process of change. Each of these factors must be considered simultaneously rather than in a bi-variate, cause and effect way.¹³⁹

There are a number of theories regarding effective behavior change strategies. These include the social models of behavior change, organizational models of behavior change, and integrated models of behavior change.⁶⁰ The social models emphasize shared beliefs, assumptions, group norms and organizational culture. Examples of practice improvement strategies based on these social models include academic detailing, educational outreach

visits, the use of local opinion leaders, and interactive workshops which provide opportunities to learn new information, practice new behaviors, and discuss problems with peers.⁶⁰

Integrated models of behavior change incorporate several different theories into a practical approach, most often utilizing some notion of “stages” of change. Each stage represents a shift in attitudes, intentions, and behaviors. Frequently, these models are applied to individuals attempting to change some health behavior. An example is the PRECEDE theory, which stands for Predisposing, Reinforcing, and Enabling Constructs in Educational Diagnosis and Evaluations.^{60, 140} According to this framework, interventions designed to change clients’ preventative health care practices must be targeted at the right audience at the right time, tailored to the individual, and follow a temporal sequence. This framework has also been applied to physician performance.^{60, 140,}

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An example of an organization model of behavior change is total quality management (TQM).⁶⁰ One of the basic beliefs of TQM is that quality efforts should focus on identifying, correcting and preventing the underlying reasons for process failures. Other beliefs include viewing the system as a whole, the need to identify the actual and potential customers of the services being provided, and the crucial role of those closest to the provision of the service in identifying all possible reasons for process failures.^{60, 142} Interventions then incorporate the identification of barriers to remediation of these process failures and subsequent strategies to overcome these barriers.^{60, 142}

Prochaska's transtheoretical model of health behavior change (TTM) (Table 6), another integrated model of behavior change, may also have some applicability to the processes health care providers go through as they contemplate assimilating new knowledge into daily activities and behaviors.⁶⁹ This model integrates processes and principles of change from different theories of intervention and represents the systematic integration of a field that had fragmented into more than 300 theories of psychotherapy.⁶⁹ A critical assumption of this model is that behavior change is a process that unfolds over time through a sequence of stages. The TTM posits that health behavior change involves progress through six stages: pre contemplation, contemplation, preparation, action, maintenance, and termination.⁶⁹ Research utilizing this model as a framework for identification has generated a rule of thumb indicating that in at risk populations, 20% of individuals are in the preparation stage, 40% are in the contemplation stage, and 40% are in the pre-contemplation stage. This model emphasizes the temporal dimension of change in individuals, and stresses the importance of tailoring the intervention to the stage of the individual. Specific processes and principles of change must be applied during specific stages if progress through the stages is to occur. Intervention programs must be matched to each individual's stage of change. Action oriented approaches, for instance, are unlikely to be successful with individuals who are in the pre contemplation stage.⁶⁹

The temporal dimension of the TTM is evidenced by the operational definition of each stage. For instance, individuals in the pre contemplation stage have no intention of making a change within the next six months, while those in the contemplation stage

intend to change behavior within the next six month time period. The individuals in the preparation stage intend to make a change within the next one month. In the action stage, individuals have made significant, overt modifications in their life styles within the past six months. Again, the emphasis is on identifying the stage the individual is currently in, and designing intervention activities to facilitate the progression on to the next stage.⁶⁹

Table 6: Stages of Change within the Transtheoretical Model

Stage	Description
Pre-Contemplation	40% of individuals within an “at-risk” population; no intention of making a change within the next six months
Contemplation	40% of individuals within an “at-risk” population; intend to change behavior within the next six months
Preparation	20% of individuals within an “at-risk” population; intend to change within the next one month
Action	Individuals have made active, overt modifications in lifestyle within the past six months
Maintenance	Individuals are working to prevent relapse, but do not apply change processes as frequently as individuals in the action stage; this stage lasts from about six months to five years
Termination	Individuals have zero temptation and 100% self-efficacy with regard to maintaining new behaviors

In addition to the temporal dimension, there are several other core constructs within the TTM. The processes of change are described as covert and overt activities that people use to progress through each of the stages. One example of this construct is consciousness raising, whereby the individual experiences increased awareness about consequences, causes, and cures relating to a particular health behavior. Other examples include self-

liberation, social liberation, counter conditioning, and contingency management.

Additional core constructs include decisional balance, self efficacy, and temptation, each of which deals with implementing and sustaining the behavior change in a variety of situations.⁶⁹

The TTM model suggests that stage matched, proactive, and interactive interventions are likely to be effective.⁶⁹ This model has been implemented in a variety of studies aimed at health behavior change, with an inconsistent level of success. Many of the studies have dealt with smoking cessation, for example. According to a recent review article, the overall the methodological quality of trials used to study the TTM is variable, and there is limited evidence for the effectiveness of stage based interventions as a basis for behavior change or for facilitating stage progression, irrespective of whether those interventions are compared with other types of interventions or with no intervention or usual care controls.¹⁴³ However, the authors of this review do qualify their conclusions based on several factors including the general lack of consistency and validity with regard to stage identification.¹⁴³ In addition, many of the studies reviewed delivered an ill-defined and non-specific intervention based solely on a baseline assessment. The authors argue that the TTM requires ongoing assessment and intervention that reflects the individual's readiness to change, and that static assessments and "one-size fits all" interventions are unlikely to be successful.¹⁴³

Diffusion of Innovations

The study of diffusion of innovation has a long history in social science, with important modern contributions from Everett Rogers and Andrew van de Ven.^{2, 125} Their theories

offers some rich ideas about the factors that promote the spread of change or hold it back, who gets involved and how, the time course of the spread, and the contextual factors that may help or hurt. Much of the research in this area has been done in social sciences. The majority of this research has been descriptive, observational, and non-experimental. Nevertheless, this theory does support some educated guesses about what might aid in the effective dissemination of knowledge to health care providers.¹²⁵

According to this theory, there are three main clusters of influence that correlate with the rate of spread of change: perceptions of the innovation, characteristics of the people who adopt the innovation, or fail to do so, and contextual factors, especially involving communication, incentives, leadership, and management.^{2, 125} The factors relating to the perception of the innovation by individuals include the relative advantage of the innovation, its compatibility with existing values and past experiences, its complexity, the trialability of the innovation- the degree to which it can be experimented with on a limited basis- and finally the observability, or the degree to which the results of the innovation are visible to others.^{2 p. 15} For example, the more knowledge individuals can gain about the expected consequences of an innovation, the more likely they are to adopt it. Also simple innovations tend to spread faster than more complex innovations, and almost all innovations will undergo some sort of local adaptation as they are implemented. Finally, the innovations are more likely to be adopted if users can test them on a small scale initially and when potential adopters can watch others try the change first.^{2 p. 15}

In addition to perceptions regarding the innovation itself, the characteristics of the people who adopt the innovation will have a profound influence on the rate of adoption of the change. (Table 7) The heart of the diffusion process consists of interpersonal network exchanges and social modeling between those individuals who have already adopted an innovation and those who are then influenced to do so. Diffusion is fundamentally a social process.^{2 p. 19} In any social system, the fastest adopting members are classified as “innovators” and are likely to make up about 2.5% of the individuals in that system.

These persons tend to be more venturesome, tolerant of risk, fascinated with novelty, and willing to leave the group to learn.^{2 p. 282} In addition, these “innovators” are likely to be wealthier and able to accept the risks and costs inherent in innovating. They also tend to be a bit disconnected socially and are not often opinion leaders. Instead they are viewed as “mavericks” who may appear to be heavily invested personally in a specialized topic.²

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The next category of individuals is termed the “early adopters,” who are more integrated socially than the innovators. This classification comprises approximately 13.5% of the overall population of the system.^{2 p. 283} There are a higher percentage of opinion leaders in this group than in other categories, and individuals in the other categories look to members of this group for information about an innovation. The early adopter is respected by his or her peers, and is the embodiment of successful, discreet use of new ideas.^{2 p. 283} When a member of this group adopts a new idea and conveys it to peers through subjective evaluation and interpersonal networks, the uncertainty about the

innovation is decreased and therefore adoption becomes much more likely across the entire system.^{2 p. 283}

The next grouping is called the “early majority” and makes up about 34% of the members of a particular system.^{2 p. 284} These individuals adopt new ideas just before the average member of a system. The early majority interacts frequently with their peers but seldom hold positions of opinion leadership in a system. They provide interconnectedness in the system’s interpersonal networks. They may deliberate some time before completely adopting a new idea.^{2 p. 284}

The final two groups make up the remaining 50% of the system. These categories are termed “late majority” and “laggards.”^{2 pp 284-285} The late majority adopt new ideas just after the average member of the system. Adoption may be both an economic necessity for the late majority and the result of increasing peer pressure. Most of the uncertainty about a new innovation must be removed before the late majority feel it is safe to adopt it. Laggards, the last in a social system to adopt an innovation, possess almost no opinion leadership and are often nearly isolated members of the system. The point of reference for decision making is frequently the past and are often in a precarious economic position, which forces these individuals to be extremely cautious in adopting any changes.^{2 pp 284-285}

Table 7: Categories of Individuals Relative to Adoption of Innovations

Innovators	2.5%; adventuresome, tolerant of risk, fascinated with novelty, willing to leave the group to learn; somewhat disconnected socially; “mavericks”
Early Adopters	13.5%; more integrated socially than the innovators; high percentage of opinion leaders and highly respected by peers
Early Majority	34%; interact frequently with peers but seldom are opinion leaders; likely to deliberate some before completely adopting a new idea
Late Majority	34%; adoption may be due to economic necessity; most uncertainty must be removed before innovation will be adopted
Laggards	16%; last to adopt; often isolated socially; point of decision making is frequently the past; precarious position may force these individuals to be extremely cautious in adopting any new changes
Innovators	2.5%; adventuresome, tolerant of risk, fascinated with novelty, willing to leave the group to learn; somewhat disconnected socially; “mavericks”

A third cluster of influences on the rate of diffusion of innovations has to do with contextual and managerial factors within an organization or social system that encourage and support, or discourage and impede, the actual process of spread. For example, organizations that foster social exchanges may see faster dissemination than those that develop habits of isolation or whose buildings have architectural features that discourage hallway chats.^{2, 125} In addition, decision making processes must be flexible and fit the social and organizational context in order to be most effective. In contrast, organizations where decision making is always authoritarian or always through consensus, may have some changes that spread quickly while others do not spread at all.^{2, 125}

Strategies to Effect Change

Across these multiple theories of knowledge utilization and change, a number of factors have been associated with successful implementation of behavior change. Several

theories suggest that there should be some sort of behavioral diagnosis to identify potential problems that may impede any proposed change.^{60, 69, 141, 142} Given the complexity of behavior change across individuals and organizations, multi-faceted intervention strategies are more likely to be effective than single strategies such as didactic lectures and written materials, which are more passive in nature.^{60, 144-146} A competent change agent within the organization is also crucial to success.¹³⁸ This change agent can ensure local ownership of the project and as such is considered to be a critical 'lever' in facilitating change. He or she must possess comprehensive knowledge of the organization and its staff, clinical credibility, and legitimate access to supportive personnel.¹³⁸ In the language of Prochaska and Rogers, this individual is likely to be an innovator or early adopter, already in the preparation or action stage of change.

An additional critical component of success is the commitment of the organization to change, both through the activities of the change agent(s) and through policies and administrative activities that encourage ongoing staff development. Examples of organizational commitment include active support from key stakeholders and ensuring that targeted staff have ownership of the change and are empowered to make the necessary changes.¹³⁸ This targeted staff must understand what the expectations are regarding the change, receive the appropriate training and resources, and be provided with support to sustain the change once it has occurred.¹³⁸

Along with organizational commitment and a credible change agent, essential ingredients for successful change in health care practice also include active support from key

stakeholders, recognition of the importance of change, face to face contact with practitioners to promote enthusiasm, and ensuring targeted staff have ownership of the innovation and are empowered to change.¹³⁸ An initiative called the South Thames Evidence-Based Practice Project (STEP) made use of each of these ingredients in an effort to establish and assess evidence-based practice in a range of clinical areas, mainly focused on nursing practices. According to a recent review of this initiative, six of the nine centers experienced a linear change process, whereby clinical guidelines were disseminated (mainly via a change agent.) Adherence to the guidelines increased, and patient outcomes improved. In the remaining three centers, the change process was more dynamic and chaotic, perhaps due to the organizational barriers unique to each of these centers. Interestingly, each of the nine programs implemented to enhance evidence-based practice was unique to each setting. All differed in size, context and content, and therefore measures of outcomes differed at each center. Interviews with project leaders led to the identification of six key factors important in achieving successful change: target staff familiar with and understanding of what is expected of them; staff having received the right training; necessary resources in place; staff motivated to participate in the change; supportive influential stakeholders; and planning for sustainability of the change once it is in place.¹³⁸

To address the reported deficiencies in care, some health care organizations have turned to clinical decision support systems, which provide practicing physicians with patient-specific assessments or recommendations to aid clinical decision making. These are defined as any electronic or non-electronic system designed to aid directly in clinical

decision making, in which characteristics of individual patients are used to generate patient-specific assessments or recommendations that are then presented to clinicians for consideration, and have also been termed “reminders.”^{146, 147} Examples include manual or computer based systems that attach care reminders to the charts of patients or that include access to medical and pharmaceutical databases, computerized physician order entry systems that provide patient specific recommendations as part of the order entry process, and regular electronic or manual chart audits. The findings from a recent review of clinical decision support systems imply that in order to best improve clinical practice, clinicians and other health care stakeholders should implement clinical decision support systems that provide decision support automatically as part of clinician workflow, deliver decision support at the time and location of decision making, provide actionable recommendations, and use a computer to generate the decision support. Physicians have been able to use this system to confirm and recall previously gathered knowledge and utilize this information during patient interaction.¹⁴⁸ Other factors relating to positive outcomes included periodic performance feedback, requests for documentation of the reason for not following system recommendations, and sharing decision support results with patients. A common theme is that these system features make it easier for clinicians to use, suggesting that an effective system must minimize the effort required of the clinician to receive and act on the system recommendations.^{146, 147}

Additional examples of strategies for improving knowledge and practice include traditional continuing education programs, audit and feedback, academic detailing, educational outreach visits, and development of evidence based clinical practice

guidelines.^{60, 144, 146} Interestingly the profession of physical therapy, along with other health care professions, has relied heavily on continuing education (CE) courses as the most common approach toward fostering knowledge translation among its members.¹⁴⁹ However, there is conflicting evidence that supports the effectiveness of this approach.^{146, 149, 150} The evidence that does exist seems to indicate that the passive educational opportunities that are frequently utilized in CE courses are poor at creating behavior change.^{144-146, 149-151} Nevertheless, many accreditation and licensure systems value attendance at such activities and as such are focused on the process, rather than outcome, of these CE activities.^{68, 149} In addition, many physical therapists believe strongly in the value of traditional continuing education conferences for their clinical practice.¹⁴⁹

The remaining strategies have also produced mixed results with regard to their effectiveness. Audit and feedback approaches offer great variety in the performance of the audits and the ways in which information is fed back to enhance performance. Auditing may be accomplished using chart review, review of electronic data in a computerized medical record system, or visual observation. Feedback may vary by level of aggregation regarding overall performance or performance with a specific patient, the kinds of data fed back, the population of interest, and by the comparison group if benchmarks are used.¹⁴⁶ Academic detailing has been used for decades to promote pharmaceuticals. A similar approach, also termed educational outreach visits, may be utilized to “detail” practitioners about optimal clinical practice in a one-on-one education session.^{145, 146, 152} Finally, it is unlikely that publishing a clinical practice guideline alone will result in practice change. Guidelines appear to be necessary but, not sufficient, for

performance improvement. They may be impossible to apply without adaptation for local use.^{145, 146}

Implications for Pediatric Physical Therapists

Pediatric physical therapists make numerous clinical decisions on a daily basis. They are likely to work with a multitude of difficult situations, many of which are characterized by complexity, uniqueness and ambiguity. The goal is to make the best judgment in a specific context.⁶⁵ Historically, these decisions have been based on expert opinion and on the initial and subsequent training received, either learned during entry level education or in advanced continuing education programs.^{24, 25} In an effort to address the inherent limitations in basing clinical decisions solely on these factors²⁷, the concept of evidence-based practice was developed.¹⁵³ This method of decision-making represented a radical shift away from a paradigm of knowledge that was based on autonomy and clinical experience.⁵ The definition of evidence-based practice includes the *integration* of best research evidence with clinical expertise and patient values.^{3, 153} Pediatric physical therapists, and indeed all physical therapists, have been encouraged to utilize evidence-based practice as a critical component of clinical decision making.^{5, 8-10, 19-21, 23, 25, 27, 46, 53,}

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One important consideration for pediatric practitioners attempting to use scientific research evidence is the *amount* of this evidence that exists. Currently there are several peer reviewed journals with a primary focus of rehabilitation and physical therapy for children. The journal *Pediatric Physical Therapy* is devoted exclusively to physical therapy for children, while journals such as *Physical and Occupational Therapy for*

Children and Developmental Medicine and Child Neurology include a broader emphasis on rehabilitation in general. Each of these journals has published over 30 research articles between 2004 and 2006, and each has published more than 350 articles since 1982. In addition, numerous other journals publish research articles focused on pediatric physical therapy-related issues. A recent search of the database CINAHL using the keywords pediatric physical therapy and going back to 1982 led to over 400 “hits.” Finally, two comprehensive textbooks, Physical Therapy for Children and Meeting the Physical Therapy Needs of Children, each with extensive reference lists and chapters devoted to a wide range of pediatric physical therapy topics, have been published within the past 12 months.^{154, 155}

Qualitative research in pediatric physical therapy has also illustrated the importance of the interaction and collaboration between therapist and patient and family in the clinical reasoning process. Factors involved in the decision making process include movement assessment and observation, psychosocial sensitivity, procedural changes, and self-monitoring and reflection. Clinical reasoning is centered on collaborative problem solving between the patient and the therapist. Knowing the patient, understanding his story, integrating the patient’s story with clinical knowledge, and then collaborating with the patient to problem solve are central components of clinical reasoning in pediatric physical therapy.^{66, 103, 105, 107} Interestingly, practice decisions are not always apparent as rational thought processes.¹⁰⁸ The knowledge that guides judgment and action is often reflected in implicit thought processes that are translated into habitual ways of observing and interacting with patients.¹⁰⁹

While empirico-analytic research and the scientific method provide a means of generating knowledge, a broader conception of knowledge is needed for the assessment and management of children whose problems can rarely be reduced to precise categorization or prescriptive management. To address the spectrum of patients' needs, the value of tacit knowledge, along with the implications for the instrumental use of knowledge, must also be considered.⁶⁵ Knowledge used to guide clinical decision making should be contextual.⁶⁵ Further, once a management strategy has been supported by external evidence, skilled reasoning is required to transfer the information to individual patients.⁶⁵ Reasoning is needed to evaluate the quality of all of the evidence, to apply evidence to specific situations, and to function in situations where there is limited evidence to guide practice.⁶⁵ Pediatric physical therapists must continually attempt to negotiate a balance that reflects practice that is guided by a combination of tacit and explicit knowledge generated through some combination of scientific evidence, expert opinion and personal experience.

Clinical decision making in pediatric physical therapy should be guided by a multi-dimensional knowledge base that includes both scientific evidence and procedural, implicit, or practical knowledge. Pediatric physical therapists are more likely to work in part time employment situations than their colleagues in other areas of physical therapy practice.⁶⁴ They are also more likely to have been in practice longer and to practice in more isolated settings such as in homes and schools.⁶⁴ As such, the processes necessary for the development of that knowledge base pose unique and difficult challenges.

Nevertheless, the effective and ongoing accumulation and utilization of knowledge to aid in routine clinical decision making underpins professional practice. It is critical that we begin to better understand how the concepts of evidence-based practice and knowledge translation can contribute to the clinical decision making process. Ultimately this should lead to improved clinical practice in pediatric physical therapy and to improved outcomes for pediatric patients and their families.

Research Questions

1. What are the current beliefs, attitudes, and practices of a group of pediatric physical therapists toward the use of scientific research evidence to guide routine clinical decision making?
2. What is the structure for a therapist-centered process that is intended to promote and/or enhance a group of pediatric physical therapists' ability to use and integrate scientific research evidence into routine clinical decision making?
3. How effective is the therapist-centered process in enhancing a group of pediatric physical therapists' ability to utilize knowledge generated by scientific research during routine clinical decision making?
4. What effect, if any, does the therapist-centered process have on the beliefs, and/or attitudes, and/or practices of a group of pediatric physical therapists toward the use of scientific research evidence in routine clinical decision making?

Significance of the Study

Physical therapists are being urged to utilize research evidence in routine clinical decision making. Traditional means of clinical decision making, which have been most strongly

influenced by professional experience, entry level and continuing education, and the influence of fellow practitioners, have been determined to be inadequate. The evidence-based practice effort thus far has largely been directed towards generating and disseminating high-quality research studies, systematic reviews of those studies, and clinical practice guidelines based on research evidence. However it has also become apparent that the mere publication of research and clinical guidelines is not sufficient to alter clinicians' behavior. This investigation will elucidate the current beliefs, attitudes and practices of a group of pediatric physical therapists toward using scientific research to guide and influence their routine clinical decision making. This investigation will also utilize a collaborative, participatory approach to identify ways in which research evidence can be accessed and utilized in a feasible manner to positively influence clinical decision making.

Physical therapist practitioners may find that the description of current attitudes toward evidence-based practice, along with the results of the intervention strategies, will have some relevance and implications for their clinical decision making. The physical therapy profession may benefit as well through increased attention on the effective dissemination and utilization of research. In addition, the participatory, collaborative approach used in this project may serve as a means to increase the clinical relevance, translation, and diffusion of the knowledge generated by this project for the clinician participants. This in turn may lead to increased recognition of Participatory Action Research as clinically relevant and applicable to future clinical research endeavors.

Chapter 3 Methods

Purpose

There were three purposes to this dissertation research. The first purpose was to provide a description of the current beliefs, attitudes, and practices of a group of pediatric physical therapists toward evidence-based practice, including how scientific research is used in their clinical decision making. Once the current beliefs, attitudes, and practices were elucidated, this information was used to address the second purpose, which was the development and implementation of a therapist-centered process for integrating research evidence into pediatric physical therapy clinical decision making. The primary investigator worked with a targeted group of pediatric clinicians in a participatory, collaborative effort to identify activities and strategies that were most likely to be effective in their unique clinical circumstances. These strategies were aimed at enhancing the use of research evidence to aid in routine clinical decision making. The third purpose was to determine the effectiveness of these strategies and their impact, if any on the attitudes, beliefs and practices of these clinicians relative to evidence-based practice.

Participatory Action Research

The overriding study design for this project was Participatory Action Research (PAR), a research approach based on the systematic study of a situation to produce new knowledge that is directly pertinent to the setting where the investigation takes place. The outcomes may also be relevant or transfer to other similar settings.⁷⁰⁻⁷⁴

Participatory Action Research systematically investigates and resolves problems experienced by practitioners and their clients, examines the effectiveness of work practices, and develops methods to resolve problems.⁷⁵ It is based, in part, on the

concepts of decentralization and de-regulation, which represent a movement away from attempts at uncovering generalizable truths and toward a new emphasis on local contexts. It is distinct from the restrictive conventional rules of traditional research in that it is not based on the premise of a concrete, tangible reality, a concept which is useful in the natural sciences but which is not as applicable in the human sciences.⁷⁵

In the human sciences, despite a profusion of theory, the application of scientific method to human events has failed to provide a means for predicting and controlling individual or social behavior.⁷⁵ The objective and generalizable knowledge embodied in traditional social and behavioral research often is irrelevant to the conflicts that practitioners encounter or has little impact on the difficulties they face.⁷⁵ Instead, the PAR approach implies a more democratic, empowering, and humanizing approach to inquiry.^{74, 75} It is the production of knowledge for its own sake, but also to produce change and to improve the lives of those involved in the research process.^{73, 74}

Participatory action research affords the researcher the opportunity to collaborate with participants in research. Together, researcher and participants develop and implement research methodologies that are best suited for a specific setting and purpose.^{72, 74} It is also known as action research, practitioner research, action science, collaborative action research, or cooperative inquiry.^{71, 74} Participatory action research is an integrated activity that combines social investigation, educational work, and action. It is a collaborative approach to inquiry or investigation that provides people with the means to take systematic action to resolve specific problems.⁷³⁻⁷⁵

A distinguishing feature of PAR is that it shifts its locus of control (albeit in varying degrees) from professional or academic researchers to those who have been traditionally called the “subjects” of research. It is based on the assumptions that the recording of events and formulation of explanations by an uninvolved researcher is inadequate, that “subjects” should participate directly in research processes, and that the research process should be applied in ways that benefit the participants directly.⁷⁵ It is inquiry that is done *by* or *with* insiders to an organization, but never *to* or *on* them. Some potential benefits of involving participants include development of more pertinent research questions, “user friendly” instruments, relevant interventions, thorough data analysis, and effective dissemination strategies.⁷²

Additional essential elements of PAR include meaningful consumer involvement in all phases, power sharing between researchers and participants, mutual respect for the different provinces of knowledge that all team members possess, bidirectional education of researchers and consumers, and conversion of results of research into new policy, programmatic, or social initiatives. There is an emphasis on dialogue, meaningful participation, and commitment to education and social change.⁷² Ethics and morality are inscribed as essential features in this form of inquiry- not simply as standards to be met in the interest of humanity but as standards that determine the very nature of the study outcomes.⁷⁵ Ethical considerations include ensuring full participatory involvement, that the knowledge generated is consensual and based on joint construction, and that participants are not treated as subjects or objects of study.⁷⁵ Finally, the nature of the

knowledge that is generated should lead to a positive, meaningful, and permanent change for the participants, beyond the conclusion of the project. These ethical considerations were respected and adhered to throughout the entire study.

Rationale for PAR

There are a number of reasons why PAR was the most appropriate way to investigate pediatric physical therapists' understanding and use of evidence-based practice, and to determine how they use knowledge generated by scientific research to guide clinical decision making. First, due to its collaborative nature, PAR is a democratic, empowering, and humanizing method of inquiry.^{74, 75} The primary investigator and the research participants, often described as “subjects” in more traditional research approaches, worked together to form mutually agreeable, clinically relevant and feasible strategies and outcomes to answer the research questions. In contrast to more traditional, “top down” research methodologies, the results of a PAR project are intended to have a “bottom-up,” direct impact on the lives of the participants. This approach was intended as a collaborative effort to identify challenges and barriers and to assist the participants, as needed in their ability to acquire, understand, and apply research evidence to their daily practice.

In addition, the objective and generalizable knowledge embodied in more traditional research aimed at examining human behavior is often irrelevant to the daily experiences of practicing clinicians. The philosophy that underlies PAR is that concepts such as “truth” and “reality” are self-constructed and relative. The goal of this PAR research was not the production of knowledge that approximates the truth for some larger population.

The goal was to build collaboratively constructed descriptions of the attitudes, beliefs, and practices of the participants. This process then enabled the participants to formulate solutions to the problems relating to use of scientific research evidence to guide clinical decisions.

Participatory action research permitted the consideration of the unique factors that were influencing each individual practitioner's ability to access and utilize research evidence. In a highly controlled study, focused on one specific intervention developed by an external investigator, factors such as years of experience, time constraints, critical analysis skills, and readiness for change would likely need to be controlled in order to reduce their impact on the dependent variables. However, in this research, each of these factors was considered in order to better understand how the participants acquired and utilized new knowledge to change behavior. Strategies for behavior change were therefore multi-faceted and addressed the contexts and concerns of each individual practitioner.

Theoretical Background

Participatory Action Research was the umbrella under which all methodological decisions were made across all phases of the project. However the theoretical background of phenomenology shaped the specific data collection strategies and methods of data analysis for the qualitative data. Phenomenology is the study of the essence of an experience, and produces an understanding of the meaning and structure of the lived experiences of the participants. Phenomenology is a way of conceptualizing how human beings make sense of experience and transform experience into consciousness, both

individually and as shared meaning.^{156 p.104} In this study, the phenomenon of interest was pediatric physical therapists' use of research evidence during clinical decision making.

Case Study Approach

The case study approach involves organizing data by specific cases for in-depth study and comparison.^{156p. 447} A case can be a person, an event, a program, an organization, a time period, a critical incident, or a community. The cases are studied in depth in order to develop an improved understanding of the phenomenon. and to describe that unit in depth and detail, holistically and in context.^{156 p 447} The case study approach to qualitative analysis constitutes a specific way of collecting, organizing, and analyzing data, the purpose of which is to gather comprehensive, systematic, and in-depth information about each case of interest.^{156 p 447} In this study, each of the participants served as a unique case. Individual case reports and a composite report were developed.

Research Plan

The PAR process is cyclical in nature.^{71, 73-75} As such, this research consisted of three distinct but interrelated phases. Phase I was the planning phase. Phase II was the acting and reviewing phase, and phase III was the observing and reflecting phase. Research methods used to collect and analyze data are presented here as they occurred during each of the three phases of the project. Thus methods used to collect and analyze data during each of the three phases are presented sequentially.

Phase I: Planning phase

The goal of the planning phase was first to identify participants for the project and then to gather information regarding evidence based practice that would lead to the development

of strategies aimed at improving the participants' skills and practices in this area. Data were collected to describe these individuals' existing beliefs, attitudes and behaviors related to evidence-based practice. The data was also utilized to describe these individual's interest in and motivation to engage in evidence based practice, educational background and knowledge and skills relating to accessing and interpreting research information, attention to and use of the scientific literature for daily practice, access to and availability of information to promote evidence-based practice, and perceived barriers to using research evidence in clinical decision making.¹² Table 8 summarizes the activities during this phase of the project.

Table 8: Planning Phase Activities
Planning Phase: April 2006 to August 2006

1. Preliminary contact with potential participants
2. Institutional Review Board approval- Duquesne University
3. Formal identification of research team members
4. Document review
5. Jette et al¹² survey
6. Individual semi-structured Interviews
7. Focus group interviews
8. Reflexive journal
9. Phase I data analysis
10. Research team meeting
11. Establishment of strategies and outcomes

Primary Investigator Background

The primary investigator had approximately 20 years of experience as a pediatric physical therapist, including American Board of Physical Therapy designation as a pediatric clinical specialist. This individual was on the faculty of a doctorate of physical therapy (DPT) program, served as member of the board of directors for the pediatric section of the American Physical Therapy Association, the chair of the state chapter pediatric special interest group, and the coordinator for the local pediatric study group. He had completed an advanced master's degree in pediatric physical therapy and was currently in the dissertation phase of a PhD program in rehabilitation science during the time period for this project. Because of these experiences, the primary investigator was strongly interested in developing effective strategies to aid pediatric clinicians in their ability to access, understand, and apply knowledge generated by scientific research to daily practice.

Preliminary Contact with Potential Participants

A core group of pediatric physical therapists who work for a private practice based in the southern suburbs of Pittsburgh, Pennsylvania were identified as potential participants.

The owner of this Practice was well known to the primary investigator due to common clinical interests and areas of expertise. In prior casual conversations, the Practice owner had expressed a desire to foster staff development in the area of evidence based practice.

The primary investigator contacted the owner and proposed this joint venture.

This group was seen as desirable because of their similarity with many other pediatric physical therapists. In a recent survey of members of the Pediatric Section of the

American Physical Therapy Association, 23% of pediatric practitioners reported that they work on a part time basis, and 30% work in educational settings.⁶⁴ None of the 16 therapists employed by this practice were designated as full time employees of the practice (although some may have worked for other employers), and all were assigned to school and pre school settings.

Institutional Review Board Approval

This project was approved by the Institutional Review Board of Duquesne University on April 19, 2006.

Identification of Participants

A stratified purposeful sampling strategy^{156p. 240} was used to select the participants. The stratification was based on the number of years of work experience a potential participant had. The rationale for this decision was that previous research identified differences in attitudes and beliefs toward evidence based practice between younger, less experienced physical therapists and their older, more experienced colleagues.¹²

The Practice owner identified herself as a participant, and five of her physical therapist employees as potential participants. The owner and employees represented practitioners who were at different stages of their career, and fit the low-medium-high stratification parameters for years in practice. Each of the five therapists was approached by the Practice owner and was encouraged to contact the primary investigator if interested in learning more about the project. The Practice owner also made it clear to the employees that they were under no obligation to participate in the project. The five practitioners did

contact the primary investigator and they along with the Practice owner were provided with an overall outline of the project, first in written format, and then followed by a telephone conversation. Four of the five practitioners and the Practice owner agreed to participate in the project and are heretofore referred to as the participants. Demographic characteristics of the five participants are presented in Table 9. All participants read and signed an informed consent prior to participating in this project.

Table 9: Characteristics of Participants

Therapist	Years in practice	Years in pediatric practice	Years as employee of The Practice	PT Degree	Hours per week	Number of children on caseload	Setting
K	6	3	3	MPT	19.5	28	Elementary School
A	1	1	1	MPT	45-50	30	Schools
L	20	20	8	MPT	30-35	30-35	Schools
R	19	3	4	BS	32	25-30	Home care/ early intervention, schools, center based school; rehab facility
P	25	22	22	DPT	30	25	Schools, early intervention

Document Review

Practice documents pertaining to evidence-based practice and how research evidence was used to inform clinical decision making within the Practice were obtained and reviewed. These documents included staff meeting minutes, staff in-service topics, continuing education courses attended by staff, all from 2003 until April of 2006, along with the

most current Practice mission statement and strategic plan. The primary investigator's review of these documents resulted in explicating the institutional practices that were in place within the Practice and any evidence based practice resources that were already available to the participants.

Jette et al¹² Survey

A survey developed by Jette et al¹² (Appendix A) was administered to the five participants and to the other 11 clinicians employed by the Practice. The survey yields data concerning the beliefs, attitudes, knowledge and behavior of physical therapists regarding evidence-based practice. It is designed to explore respondents' attitudes and beliefs about EBP (survey items 1, 2, 4, and 6–11); interest in and motivation to engage in EBP (survey items 3 and 5); educational background and knowledge and skills related to accessing and interpreting information (survey items 19-25); level of attention to and use of the literature (survey items 12–14); access to and availability of information to promote EBP (survey items 15-18); and their perceived barriers to using evidence in practice (survey item 26). Demographic and practice data were collected.

The rationale for using this survey with the 11 additional physical therapists employed by the Practice was to gather quantitative data about the beliefs, attitudes, and practice of these individuals. These data permitted a further description of the participants and the other employees of the practice on such factors as attitudes and beliefs about evidence-based practice, interest in and motivation to engage in evidence-based practice, educational background and knowledge and skills related to accessing and interpreting information, level of attention to and use of the literature, access to and availability of

information to promote evidence-based practice, and their perceived barriers to using evidence in practice. In addition, this data permitted comparison of the Practice employees to the respondents in the original article by Jette et al¹², which was a national survey of the beliefs, attitudes, knowledge, and behaviors of physical therapist members of the American Physical Therapy Association.¹²

Individual Semi-Structured Interviews

A 1-hour, semi-structured individual interview was conducted with each participant to gather in depth qualitative data concerning the participant's attitudes, beliefs, and practices with regard to evidence-based practice. This aided in determining how and to what extent the participants were utilizing research evidence to inform clinical decision making at the outset of this project (Appendix B). The interviews were tape-recorded and transcribed verbatim by the primary investigator.

Focus Group Interview

After the individual interviews were completed, transcribed and reviewed, the primary investigator conducted a 90-minute focus group interview (Appendix C) with the five participants. A focus group interview is an interview with a small group of people on a specific topic. Focus groups typically consist of 6-8 people who participate in the interview for 1 ½ - 2 hours. The object is to get high quality data in a social context where people can consider their own views in the context of the views of others. It is not necessary for the group to reach any kind of consensus, nor is it necessary for people to disagree. Advantages to focus group interviews include enhanced data quality due to interactions among participants who are likely to serve as checks and balances to each

other, and an increased ability to establish both consistencies and divergences among the participants.^{156 p. 385-386}

The focus group interview provided a forum for group discussion regarding the phenomenon of evidence-based practice within the Practice. The focus of the interview questions and discussion was on the ways in which this construct had been supported, or not supported, within the Practice and across the various settings where these clinicians provide physical therapy services. The focus group interview was also tape-recorded and transcribed by the primary investigator.

Reflexive Journal

Participatory action research is somewhat unpredictable process, and a key part of the inquiry was to maintain a recording of decisions made in the face of this unpredictability.^{71 p.78} Therefore, during each phase of this project, the primary investigator kept a reflexive journal.^{76 p.327} The reflexive journal is a vital piece of PAR methodology. It is a chronicle of research decisions, a record of thoughts, feelings, and expressions, as well as a document reflecting the increased understanding that comes during the research process. This journal included the primary investigator's notes from each individual and focus group interview, along with regular journal entries as a means to document reflections on the information that was gathered. This also included documentation of important ethical and methodological decisions that occurred throughout the project.

Phase I Data Analysis

During the planning phase and prior to the final research team meeting and establishment of strategies and outcomes for Phase II, the quantitative data gathered through the Jette et al¹² survey, and the qualitative data derived from the document review, individual interviews, and focus group interview were analyzed. This reflects the ongoing integration of data analysis and research activities and the PAR philosophy aimed at building collaboratively constructed descriptions and solutions to the problems faced by a group of individuals.^{75p.43} In this project, during the planning phase, the collaboratively constructed descriptions of the challenges and successes relating to evidence-based practice served as a basis for generating potential strategies and solutions to these challenges.

Phase I Quantitative Data Analysis

Data from the Jette et al¹² survey were analyzed using SPSS version 12.0 for Windows. The data from this survey were analyzed for response frequencies for each question. These data were then utilized to compare the Practice employees to members of the Pediatric Section of the APTA and to the respondents on the original Jette et al¹² survey.

Phase I Qualitative Data Analysis

The qualitative data derived from the document review and individual and focus group interviews were analyzed by the primary investigator. First, documents from the practice that had been gathered were reviewed for content referring specifically to the construct of evidence based practice as a primary objective or goal of the practice, or as a specific in-service topic or continuing education course offered to the employees by the Practice. In

addition, a topical outline of the continuing education courses attended by Practice employees was also analyzed for content relevant to evidence based practice.

Prior to analyzing the data from the individual and focus group interviews, the primary investigator utilized a process termed “bracketing”. Bracketing occurs when the researcher explicitly identifies any preconceived biases about the data and sets aside these biases prior to analyzing data. Bracketing is an effort to permit data analysis to proceed from a non judgmental stance and reduce the influence of presuppositions on the data itself. It is a means to enhance the trustworthiness and credibility of the data analysis process.^{156 p. 485} For example, in this study, the stratified purposeful sample could have led the primary investigator to assume that new graduates would be more skilled at evidence based practice than their more experienced colleagues. This potential for preconceived bias was identified and set aside in such a way that the primary investigator was conscious of the potential for bias but separated this potential from the actual analysis.

Next, given the significant volume of narrative data that existed for each participant, the primary investigator read and re-read the individual and focus group transcript data for each participant and identified broad, overarching initial impressions that emerged from those data. In doing this, the primary investigator developed an initial sense of what stood out most with respect to each participant. This broad-brush approach enabled the primary researcher to get an initial impression of “who” each participant was, with respect to the topic of evidence based practice. A qualitative data analysis expert reviewer reviewed

the primary investigator's initial impressions that resulted from this review. This individual had over six years of experience as a qualitative researcher and has participated in multiple qualitative research projects, both as a primary investigator and as a co-researcher. This individual was also closely involved with the development and implementation of this project. After review, the qualitative data analysis expert concurred that the primary investigator's initial impressions were accurate to the data. The interview transcripts and initial impressions were sent to each participant for review to further ensure accuracy of interpretation.

In addition, throughout the data analysis process, the primary investigator worked closely with a peer debriefer. A peer debriefer is a peer or colleague willing to assist the primary investigator in exploring aspects of the inquiry that might otherwise remain only implicit within the inquirer's mind.^{76p 308} The peer debriefer served as a sounding board for the primary investigator as he made meaning of the information being gathered, and posed questions regarding how it is that the primary investigator "knew" what he knew. The primary investigator met with the peer debriefer on a bi-weekly or as needed basis to discuss issues pertaining to the research.

Once the interview transcriptions were returned by the participants, they were entered into the Atlas ti qualitative data analysis software program. The software enabled the primary researcher to manage the very large volume of narrative data that existed; the software did not analyze the data for the primary investigator.

The primary investigator then began the process of open coding.¹⁵⁷ Open coding emphasizes the importance of being open minded to the data. A coded piece of data is the smallest item of analyzed data in qualitative research. The process involved reading each participant's individual interview transcription and the focus group transcription line by line and highlighting phrases, sentences, groups of sentences, and/or small paragraphs that contained a meaningful, distinct thought pertaining to evidence based practice. Each distinct thought was labeled with a one or two word code that enabled the researcher to later retrieve, sort and organize data into larger categories that contained similar ideas. The data analysis expert reviewed the coded data and verified agreement with the primary investigator's analysis of the data.

After all data had been coded, the primary investigator began the process of re-assembling the coded data into larger, synthesized units of meaning. During this process, and for each participant, similar codes and their corresponding data were grouped together into categories. Categories contained groups of similar information that were labeled with a phrase or sentence that reflected the content of information in that group. For example, the category "education influences" included the codes of "influence of entry level education", "influence of continuing education", and "influence of transitional doctorate of physical therapy education".

The categories for each participant were then organized and synthesized to produce a single case report for each participant. Five individual case reports were written. In addition a cross case analysis was completed across each of the five individual case

reports. This cross case analysis and the Practice information from the document review, Jette et al¹² Survey, and focus group interview were combined to develop a case report for the Practice.

Each participant reviewed her own case report and the Practice case report to ensure the accuracy of the interpretation. The primary investigator and the participants used these reports to gain a greater understanding of the overall construct of evidence based practice for themselves individually and for the Practice. The knowledge gained from this process and these reports led directly to phase II, the acting phase, where action strategies and outcome measures to improve the participants' use of research to inform the clinical decision making were determined.

Trustworthiness

Any research ultimately needs credibility to be useful. This requires that the investigator adopt a stance of neutrality with regard to the phenomenon under study. However in qualitative research, neutrality is not an easily attainable stance, so all credible research strategies include techniques for helping the investigator become aware of and deal with selective perception, personal biases, and theoretical predispositions. These techniques are aimed at producing high quality data and analysis that is of sufficient rigor, or trustworthiness, and fair to the people studied.^{156p. 51} “The basic issue in relation to trustworthiness is simple: How can an inquirer persuade his or her audiences (including self) that the accountings of an inquiry are worth paying attention to, worth taking account of?”^{76 p. 290} Aspects of trustworthiness relative to the qualitative data analysis

process, including credibility, transferability, dependability and confirmability were addressed through a variety of methods and techniques.^{76, 156}

Credibility

Credibility refers to the outsider's perception of the research findings as plausible and accurate to that situation. It is therefore necessary to conduct the inquiry in such a way that the probability that the findings will be found to be credible is enhanced.^{76p. 296} The credibility of this project was addressed in several ways.

Prior to the initiation of the planning phase, the individual interview, focus group interview, and qualitative data analysis process were each piloted. The individual interviews were administered to two physical therapist practitioners while the focus group interview was piloted with a group of seven pediatric physical therapists. Each of these individuals was given the opportunity to provide feedback on the interview process and the quality and content of the interview questions. The primary investigator and the qualitative data analysis expert utilized a similar data analysis process to that described in the planning phase. These pilot interviews and analyses enhanced the quality and consistency of the processes utilized to achieve the objectives of the planning phase.

Member checking was utilized as each research team member received her individual interview transcription, the focus group interview transcription, her case report, and the case report for the Practice.⁷⁶ Member checking involved each participants' review of the transcriptions, essential themes, and case reports. For each step, the participants provided feedback, comments, and suggested changes in order to ensure that the findings were

accurate and credible. This enabled the participants to verify that the findings throughout the project were accurate and credible.^{76p.314}

Following the analyses by the primary investigator, the qualitative data analysis expert reviewed each interview transcription, essential theme, coding category, and sub category. The data analysis expert also reviewed the assignment of data units to coding categories and sub-categories. Areas of disagreement with the primary investigator were minimal and were resolved through discussion and mutual consensus.

Other means of establishing credibility included prolonged engagement, persistent observation, triangulation of methods and data analysis, peer debriefing, and reflexive journaling. Prolonged engagement requires the investment of sufficient time to achieve several purposes: learning the “culture,” testing for misinformation introduced by distortions either of the self or of the respondents, and building trust.^{76p.301} The collaborative nature of the PAR process, the group and individual interactions, and the use of document review led to a prolonged engagement with the participants. The purpose of persistent observation is to identify those characteristics and elements in the situation that are most relevant to the problem or issue being pursued and focusing on them in detail. There were several opportunities for persistent observation. This project involved multiple meetings and interactions between the primary investigator and the participants over the course of phase I.

The primary investigator also implemented a systematic search for alternative themes, divergent patterns, and rival explanations that were intended to enhance the credibility of this project.¹⁵⁶ This meant considering other logical possibilities for themes and patterns, then determining whether the data supported these possibilities. The qualitative data analysis expert review further emphasized this systematic search for alternative themes and patterns.

Credibility is also addressed through triangulation, or the use of multiple techniques, to study the same issue.^{76p.305} In this project, the use of several different data collection methods, including the Jette et al¹² survey along with the individual interviews and focus group interviews provided triangulation of methods.¹⁵⁶

An additional means of addressing credibility during the project was the reflexive journal.^{76 p. 327} This reflexive journal included the primary investigator's notes from each individual and focus group interview, along with regular journal entries throughout the course of this research as a means to document reflections on the information that was gathered. This also included a discussion of important ethical and methodological decisions that occurred throughout the project.

Finally, because action researchers are so involved in the action research process at multiple levels and in multiple roles, it is common to work with a peer debriefer. A peer debriefer is a peer or colleague willing to assist the primary investigator in exploring aspects of the inquiry that might otherwise remain only implicit within the inquirer's

mind.^{76p.308} This peer debriefing process served to push the primary researcher to a more sophisticated level of understanding because the researcher was required to make explicit what he understood on a more tacit level. As noted previously, the primary investigator met with the peer debriefer on a bi-weekly or as needed basis to discuss issues pertaining to the research.

Transferability

Transferability refers to the reader's decision as to whether the findings of a study can be applied to their individual setting.^{76, 156} The researcher does not determine the transferability of an inquiry. It is up to the reader to determine whether the information gathered and conclusions drawn from this study can be transferred or applied to his/her own particular circumstance.^{76p.316} Thick description of each Individual case and of the Practice enables the reader to clearly envision the setting, events, individuals, and processes that occurred during this phase and each subsequent phase.

Dependability & Confirmability

Dependability and confirmability in qualitative research are analogous to reliability in quantitative research. Dependability is related to the consistency, stability, and predictability of the data analysis process while confirmability refers to the objectivity or neutrality of the researcher in that his findings are not unduly influenced by bias or opinion.^{76p.299-300} Triangulation, as described above, is one means of establishing the dependability and confirmability of the findings through the concept of "overlapping of methods." Therefore the use of the document review, the Jette et al¹² survey, individual interviews, and focus group interviews, enhanced the dependability and confirmability of

the results. The input from the qualitative data analysis expert reviewer also contributed to the confirmability and dependability of the findings. This qualitative data analysis expert reviewer also reviewed the audit trail, which included all of the documents gathered during the course of this project and all data analysis processes.^{76p.319} All of the audit trail documents continue to be maintained and are available for review. Examples include raw data in the form of completed questionnaires, document review materials, and interview transcriptions; data analysis processes including coding categories, sub-coding categories, and essential themes for each participant; reflexive journal entries; research team interactions including emails, phone conversation notes, and notes from research team meetings; and notes from meetings with peer debriefer and with co-researcher.

Research Team Meeting

At the end of the phase I (July-August, 2006), the primary investigator and research team members met to accomplish two important tasks. First, to discuss the outcomes of phase I data collection, and second to determine the strategies that would be implemented during phase II, the acting phase. Phase I had resulted in individual case reports and a composite Practice case report of the beliefs, attitudes and practices of Practice employees related to evidence-based practice. During the research team meeting, the primary investigator and participants discussed the case reports and determined the Acting Phase strategies that the team members would utilize to increase the number and effectiveness of participants' evidence-based practice activities or practices. These strategies were intended to enhance each participant's ability to use research evidence in daily clinical practice.

The primary investigator and participants also determined intended outcomes for each individual participant. Outcomes were defined as things that would be achieved upon conclusion of the acting phase. These included skill development and behavior change relating to evidence-based practice. Some examples include increased frequency of database searches and increased frequency of journal articles read.

The time frame/ parameters for phase II were also determined by the primary investigator and the participants. Ways to measure and determine outcomes were also identified. These were procedures and/or assessments that would be used to determine any changes that occurred in evidence-based practices as a result of the implementation of the strategies. See Table 10 for a listing of strategies and outcome measures generated by the research team meeting.

Table 10: Therapist Centered Processes for the Acting Phase

Proposed Strategies	Processes
Increase awareness of and access to appropriate information <ol style="list-style-type: none"> 1. Utilize APTA resources 2. Utilize resources available through relationship with local PT schools 3. Utilize resources available through the internet 	<ul style="list-style-type: none"> • Core group members to investigate and access on their own, including at home and during work day • Workshop to address individual skills and knowledge relative to evidence-based practice
Continuing Education Workshop	<ul style="list-style-type: none"> • Provided by primary investigator to all participants and also open to other Practice employees
Follow up online activities	<ul style="list-style-type: none"> • Practice owner to investigate potential for website to handle an online case discussion board and accessible files for all employees • Explicit effort to integrate research evidence into case discussion • CAT (critically appraised topics) files posted on Practice website • Follow up evidence-based practice exercise
Increase utilization of research evidence to assist with clinical decision making	<ul style="list-style-type: none"> • Increased individual attention to this aspect of professional practice
Proposed Outcomes	Processes
Self rating (0 to 10 scale from each individual interview)	<ul style="list-style-type: none"> • Self rating will again be part of follow up interviews
Goal Attainment Scaling	<ul style="list-style-type: none"> • Self rating on individual goals
Pre and post test on understanding of research and article analysis skills	<ul style="list-style-type: none"> • Connolly Survey at baseline and at follow up
Individual and focus group interviews in the Phase III of this research project	<ul style="list-style-type: none"> • Used to further describe process and outcomes
Jette Survey	<ul style="list-style-type: none"> • Also during phase III; to further describe outcomes

Phase II: Acting Phase

The purpose of phase II, the acting phase, was for the participants to implement the “therapist centered processes” aimed at enhancing their ability to access and utilize research evidence to guide clinical decision making. Therapist centered processes were defined as mutually agreed upon intervention strategies and outcomes generated by a

collaborative effort between the primary investigator and the other participants. The individual and group strategies and outcomes are listed in Table 13.

Individual Strategies

The proposed individual strategies included increased efforts towards obtaining access to available computers and the internet, either in the home or during the work day. Several participants identified a lack of computer access as a barrier to evidence-based practice. In addition, these individual efforts also centered around attempts to improve skill with accessing, navigating, and utilizing online resources such as the world wide web, research databases, and professional organization resources such as the American Physical Therapy Association web page.

An additional individual strategy was an explicit effort to increase the integration of research evidence into clinical decision making. Each of the participants indicated that participation in this project was a first step towards improvement in this area of practice. Several of the participants identified specific goals relating to using research evidence on a more routine basis during clinical practice.

Group Strategies

The proposed group strategies were developed in part to address the individual needs of the participants, and specifically their skills with regard to accessing information and applying it to clinical decision making. The participants were strongly opposed to a strategy that was limited to a packet of written materials providing guidance and

instructions on evidence-based practice. The Practice owner had attempted similar strategies in the past with regard to other areas of practice, and these written handouts were judged to be ineffective. The participants instead indicated that a group workshop activity designed to provide instruction in the fundamental aspects of evidence-based practice would be more effective. In addition to providing a review of necessary skills, this group workshop also afforded an opportunity to practice those skills with supervision and interaction with colleagues. The group determined that the workshop would be led by the primary investigator. The rationale for this choice was that the primary investigator had extensive experience in pediatric physical therapy and in assisting entry level and experienced physical therapists in translating research evidence into practice. In addition, due to post professional education in this area, the primary investigator possessed a broader and more extensive knowledge with regard to evidence-based practice than the other participants. Finally, due to his familiarity with the needs of the other participants, the primary investigator was well positioned to tailor the workshop to those needs.

The workshop handout, including session description, is included in Appendix D. The objectives for this workshop are listed in Table 11. The workshop occurred on a Saturday morning and lasted for four hours. Two of the participants were unable to attend due to unexpected personal reasons, so each was provided with a copy of the handout and an extensive phone call follow up with the primary investigator to clarify important issues and address any questions or concerns. A total of seven people attended the workshop: the primary investigator, three participants, and three additional physical therapist employees of the Practice.

Table 11: Evidence-Based Practice Workshop Objectives

After participating in this workshop (including follow up activities), the attendee will be able to:

1. Define evidence-based practice
2. Discuss the relevance of “evidence” and evidence-based practice to pediatric physical therapy practice
3. Distinguish between a background question and a foreground question
4. Write a clinical question based on PICO format (Patient/Intervention/Comparison/Outcome)
5. Identify and access appropriate resources for obtaining research evidence relating to physical therapy practice
6. Utilize APTA and/or internet resources to develop an evidence-base answer to a clinical question
7. Understand basic research and statistics terminology
8. Utilize understanding of research and statistics to analyze strength of the evidence
 - a. Diagnosis, prognosis, and intervention evidence
 - b. Sackett levels of evidence and grades of recommendation
 - c. AACPDM ranking system
9. Formulate the answer to the clinical question into a CAT document or Matrix spreadsheet
10. Apply the results of clinical research to physical therapy practice

The participants also indicated a need for a follow-up activity to aid in the application of the skills learned during the workshop. After some discussion, several follow up strategies were identified. These included the opportunity to post clinical questions and case scenarios online on the Practice website, along with the generation of CATs (critically appraised topics) that could also be posted and open to all Practice employees.⁵¹ This option did not exist at the time of the workshop, and the Practice owner indicated a willingness to pursue this with her web page consultant.

Another follow-up activity was an online evidence based practice exercise led by the primary investigator. This exercise included several phases, each separated by three to

four days, and each provided through email communication to all of the participants. The first phase was the description of a hypothetical clinical case and the identification of a clinical question based on that case. During the second phase, the primary investigator explicitly described the search strategies utilized to gather evidence aimed at answering the clinical question. The primary investigator then identified key research articles that were most appropriate to obtain and analyze for the clinical question. During the final phase, the primary investigator shared his critical analysis of the research articles and his answer to the clinical question, based on the evidence. This exercise was designed to allow the participants to work along with the primary investigator and to compare their efforts with his. The process would then be repeated, with one of the participants taking on the leadership role in identifying the clinical question, performing the search, and generating an evidence-based answer to the question.

Outcomes

The first outcome chosen by the participants was a self-identified evidence-based practice ranking. This ranking was a part of the individual interview during phase I. During the individual interviews in both phase I and phase III, this was presented to each participant as follows: “If you could place yourself on a continuum of evidence based practice, with 1 being completely not being an evidence based practitioner and 10 being a complete or optimal evidence based practitioner, where would you put yourself today?” The participants indicated that an increase in this ranking would represent an improvement in overall comfort level and confidence with evidence-based practice.

The participants agreed that identifying individual goals relating to evidence-based practice would be an appropriate outcome for this phase of the project. An important consideration is that goals may affect performance by focusing attention, directing effort, increasing motivation, and enabling the development of strategies to achieve objectives. Goal setting theory is based on the hypothesis that all conscious human behavior is purpose driven and guided by an individual's goals.^{158, 159} Therefore in the context of this project, setting individual goals may have also served as an intervention strategy in addition to providing an outcome measure.

Based on a suggestion from the primary investigator, the participants utilized a “goal attainment scaling” (GAS) framework in establishing their individual goals.^{160, 161} A number of researchers have used GAS as an option for establishing and monitoring individualized goals in a variety of subject areas including mental health, occupational therapy, physical therapy, special education, professional development, and rehabilitation.^{158, 162-165} This framework requires that the identified goal is assigned a “zero” score. Additional scores of +1 and +2 are assigned to outcomes that are increased or improved when compared to the 0 score. Conversely, scores of -1 and -2 indicate a decline in the intended outcome, with a -2 representing a more substantial decline.^{158, 160,}
¹⁶¹ This process takes goal achievement further by allowing a calibration of degree of success, recognizing partial completion and additional achievement, as opposed to the “all or none” approach of most goal-setting systems.^{158, 160, 161} The procedure for this project was that each participant identified at least two goals that were measurable and attainable within a six month time frame. Once the goals were established, the participant

then worked with the primary investigator to generate GAS goals that corresponded to the -2, -1, +1, and +2 scores. During the individual interview in phase III of the project, each participant then self-reported her score on each GAS goal.

The participants also identified the importance of an outcome relating to a pre and post measure specific to evidence-based practice skills. A questionnaire originally developed and utilized by Connolly et al³⁴ was identified for this purpose (Appendix E). This questionnaire contains 10 items and was designed to assess self reports of knowledge and behaviors related to research. This includes self reports of comfort level and confidence in reading and applying research findings, personal habits regarding reading the professional literature, and beliefs regarding the importance of research to the profession. The questionnaire also attempts to measure perceived source of authority for clinical decision making and beliefs about how research is viewed by professional colleagues in physical therapy.³⁴ The authors described a brief validation process relating to utilization of this questionnaire to measure changes in entry level physical therapy students' attitudes and perceptions about research in physical therapy.³⁴ This validation process included a review by a panel of experts from the American Physical Therapy Association Section on Research. These experts, selected due to their research knowledge and productivity, reviewed each item for clarity, content validity, and construct validity to ensure that the questions accurately reflected the construct of self-reported knowledge and behaviors related to research. The items were formulated to determine whether changes occurred across time.³⁴

The scores on each item of the questionnaire for all participants were combined to provide a mean score for comparison with the results of the original Connolly article. These scores were also analyzed for differences between baseline and follow up at the end of the acting phase utilizing the Wilcoxon Signed Rank Test for matched pairs. Based on the categorization of the individual items in the questionnaire, several survey items were combined so that, for example, the participants' self-reported knowledge and behaviors about research could be compared for changes between the beginning and end of the acting phase. Finally, individual pre and post scores were analyzed to aid in describing changes that may have occurred for each participant in these areas.

The final two outcomes for the Acting Phase occurred during the final phase of this project, the observing and reflecting phase. Semi-structured individual interviews, a focus group interview, and the Jette et al¹² survey were utilized to describe the participants' beliefs, attitudes and practices relating to evidence-based practice. This was also an opportunity to reflect on any changes that may have occurred in these areas and on the impact of the project on the participants' professional practice. Finally, it was an opportunity to reflect on the participatory research process and to provide suggestions for future directions for the Practice.

Length of the Acting Phase

The research team collaborated to determine the most appropriate length of phase II.

There were several considerations in determining this. First, according to Prochaska's Transtheoretical Model of Health Behavior Change,⁶⁹ the temporal aspect is a primary construct for the stages that individuals go through during the process of behavior

change.⁶⁹ Individuals in the *pre-contemplation* stage are not intending to take action in the foreseeable future, usually measured as the next six months. In the *contemplation* stage, there is an intention to change in the next six months. These individuals are becoming more aware of the advantages of changing, but are still acutely aware of the disadvantages and challenges inherent in making a change. In the *preparation* stage, there is an intention to take action in the immediate future, usually measured as the next month.⁶⁹ During the *action* stage, people have made specific overt modifications in their life styles within the past six months. Finally maintenance is the stage in which people are working to prevent relapse but they do not apply change processes as frequently as do people in action. It is estimated that the maintenance phase can last from six months to five years.⁶⁹

In this project, the research team demonstrated behaviors that placed them in either the preparation or action stage. The team members took significant actions within the past year in conjunction with the beginning of this project in order to increase their evidence based practice behaviors, including participating in this research project and agreeing to attend the continuing education workshop. According to this model, one may expect additional behavior change relating to evidence based practice among research team members within one month after the action phase of the project began.

Second, according to Rogers², the innovation-decision process is the process through which an individual passes from first knowledge of an innovation, to the formation of an attitude toward the innovation, to a decision to adopt or reject, to implementation and use

of the new idea, and to confirmation of this decision.² The five main steps of the innovation-decision process include (1) knowledge, (2) persuasion, (3) decision, (4) implementation, and (5) confirmation. This process is an information seeking and information processing activity in which an individual obtains information about the innovation in order to gradually decrease uncertainty about the innovation and its consequences. These five steps usually occur in a time-ordered sequence. The innovation-decision period is the length of time required to pass through the innovation-decision process. Individuals vary in this innovation-decision period, with some people requiring many years to adopt while other people move rapidly from knowledge to implementation.²

Most innovations have an “S” shaped rate of adoption. At first, only a few individuals adopt the innovation- these are the innovators.² In this project, evidence-based practice behaviors were considered to be the innovation. Given the research team members’ readiness for change, these individuals were categorized as innovators and as such were likely to adopt the innovation relatively quickly compared to other practitioners. As the diffusion curve begins to climb, more and more individuals adopt the innovation in each succeeding time period. Eventually the trajectory of the rate of adoption begins to level off, as fewer and fewer individuals remain who have not yet adopted the innovation.²

In addition, in recent research aimed at generating behavior change relating to the “innovation” of evidence based practice, the length of time for the intervention or acting phase has been variable. In a study aimed at diffusing evidence relating to fall prevention,

participants were contacted by telephone or electronic mail at least six weeks after (range six-24 weeks) the intervention.¹⁶⁶ Outcomes for an evidence-based practice education program were measured at three and six months following completion of the program.¹⁶⁷ Similarly, the effectiveness of an intervention program aimed at improving critical appraisal skills for health care professionals was determined by assessing outcomes at a six-month follow-up time period.¹⁶⁸ Other studies investigating similar constructs have assessed outcomes over a range of time periods between eight months and two years or longer.^{138, 169, 170}

Finally, given the collaborative nature of this project, it was important to include the research team members in the decision regarding the length of the acting phase. Each participant was contacted through email and asked to indicate a preference for the length of the acting phase. The consensus among the group members was that six months was a logical and feasible time frame within the school year schedule, and was preferable to shorter time frames. Based on this input and the information above, the length of time for the action phase of this project was six months, beginning on September 1, 2006 and ending on March 1, 2007.

Phase III: Observing and Reflecting Phase

During this final phase, the main objective was for the primary investigator and the participants to come together to assess both the processes and outcomes of the project.

This occurred in a number of ways including ongoing communication about the status of the project through email contacts. The participants also took the Jette et al¹² Survey again and participated in individual semi-structured interviews and a focus group

interview. In addition, the results of the outcomes from the acting phase, the Jette et al¹² Survey, and the interviews were shared with the participants for review and comment. All of this information was integrated into the case reports for each of the participants and for the Practice.

Jette et al¹² Survey

The survey developed by Jette et al¹² (Appendix A) was once again administered to the five participants. As noted previously, the survey yields data concerning the beliefs, attitudes, knowledge and behavior of physical therapists regarding evidence-based practice. It is designed to explore respondents' attitudes and beliefs about EBP (survey items 1, 2, 4, and 6–11); interest in and motivation to engage in EBP (survey items 3 and 5); educational background and knowledge and skills related to accessing and interpreting information (survey items 19-25); level of attention to and use of the literature (survey items 12–14); access to and availability of information to promote EBP (survey items 15-18); and their perceived barriers to using evidence in practice (survey item 26).

Individual Semi-Structured Interviews

A 1-hour, semi-structured individual interview was conducted with each participant to gather in depth qualitative data concerning the participant's attitudes, beliefs, and practices with regard to evidence-based practice, with a focus on how each of these factors may or may not have changed as a result of participating in this project. The participants were asked to explicitly reflect on any changes that may have occurred

during the time frame of the acting phase, individual goals relating to evidence-based practice, and future directions both individually and for pediatric physical therapists. (Appendix F) The interviews were tape-recorded and transcribed verbatim by the primary investigator.

Focus Group Interview

After the individual interviews were completed, the primary investigator conducted a 90-minute focus group interview (Appendix G) with four of the five participants (one participant was unable to attend due to unforeseen personal circumstances.) A focus group interview is an interview with a small group of people on a specific topic. Focus groups typically consist of 6-8 people who participate in the interview for 1 ½ - 2 hours. The object is to get high quality data in a social context where people can consider their own views in the context of the views of others. It is not necessary for the group to reach any kind of consensus, nor is it necessary for people to disagree. Advantages to focus group interviews include enhanced data quality due to interactions among participants who are likely to serve as checks and balances to each other, and an increased ability to establish both consistencies and divergences among the participants. ^{156 p. 385-386}

The focus group interview provided a forum for group discussion regarding the phenomenon of evidence-based practice within the Practice at the conclusion of this project. (See Appendix G) The emphasis was on the impact of the various individual and group strategies, and the reasons for their effectiveness or lack of effectiveness. Participants were encouraged to share individual strategies and to consider future directions, as well as to reflect on the effectiveness of the participatory research process.

The focus group interview was also tape-recorded and transcribed by the primary investigator.

Phase III Data Analysis

The quantitative data gathered through the Jette et al¹² survey and the qualitative data derived from the individual interviews and focus group interview were analyzed in a similar fashion to that described in Phase I. Differences in data analysis between Phase I and Phase III are highlighted below.

Quantitative Data Analysis

Data from the Jette et al¹² survey were analyzed using SPSS version 12.0 for Windows. The data from this survey were analyzed for group differences based on the categorization of items originally described by the authors. The participants' attitudes and beliefs about EBP are described utilizing survey items 1, 2, 4, and 6–11; interest in and motivation to engage in EBP in survey items 3 and 5; educational background and knowledge and skills related to accessing and interpreting information in survey items 19-25; level of attention to and use of the literature in survey items 12–14; access to and availability of information to promote EBP in survey items 15-18; and their perceived barriers to using evidence in practice in survey item 26.¹² The scores on each item of the survey for all participants were analyzed for differences between phase I and follow up during phase III utilizing the Wilcoxon Signed Rank Test for matched pairs. Also, based on the categorization of the individual items as noted above, several survey items were

combined so that, for example, the participants' attitudes and beliefs about evidence-based practice could be compared for changes between phase I and phase III. Finally, individual pre and post scores were analyzed to aid in describing changes that may have occurred for each participant in these areas. This information was utilized to describe any changes that may have occurred among the participants in each of these areas between phase I and phase III.

Qualitative Data Analysis

The qualitative data derived from the document review and individual and focus group interviews were analyzed by the primary investigator. An identical process to phase I was utilized, with the exception of the document review and analysis, which did not occur during this phase.

Chapter 4 Results

Phase I: Planning Phase

The primary purpose of the planning phase was to gather data about the participants and the Practice. This data was used to describe the participants and the Practice and to aid in the development of a therapist-centered process intended to promote and/or enhance the participants' ability to use and integrate scientific research evidence into routine clinical decision making. See Table 8 for a summary of planning phase activities.

Institutional Review Board Approval

Institutional Review Board Approval was obtained from Duquesne University on April 19, 2006. All research team participants read and signed an informed consent to participate in this project.

Data Collection

There were three main data collection activities during the planning phase. These included the document review, administration of the Jette et al¹² survey to all physical therapist employees of the Practice, and the individual and group semi-structured interviews with the participants. The purpose of these activities was to address the first research question: What are the current beliefs, attitudes, and practices of a group of pediatric physical therapists toward the use of scientific research evidence to guide routine clinical decision making? An additional purpose was to aid in the development of

the therapist-centered process intended to promote and/or enhance the participants' ability to use and integrate scientific evidence into routine clinical decision making. The development of this therapist-centered process occurred following the planning phase data analysis and just before the initiation of phase II- the acting phase. The results from the planning phase are integrated into the case report for the Practice and the case reports for each participant.

Case Reports

Practice Case Report

A survey, developed by Jette et al¹², was mailed to all physical therapists (n = 16) employed by the Practice. This survey was used to gather information to describe the respondents' beliefs, attitudes, knowledge, and behaviors regarding evidence-based practice. A cover letter was included which described the research project and requested that the survey be completed and returned in an addressed, stamped envelope, to the primary investigator. The Practice owner sent a follow up email approximately two weeks after the initial mailing as a reminder prompting the employees to return the survey. All five of the participants (100%) completed the survey, while five out of 11 other physical therapist employees (45%) completed the survey for an overall return rate of 10/16 (62.5%). See Tables 12 and 13 for a summary of demographic and practice characteristics for the Practice employees.

Table 12: Demographic Characteristics of the Employees of the Practice

Characteristic	Practice Employees
Gender	
Male	0
Female	10/10
Age (y)	
20-29	1/10
30-39	1/10
40-49	4/10
50 +	4/10
Years licensed	
<10	2/10
>15	8/10
Entry-level degree	
Certificate	1/10
Baccalaureate	6/10
Master's	3/10
Doctorate	
Highest degree	
Baccalaureate	5/10
Professional Master's	3/10
Advanced Master's	1/10
Prof. Doctorate	1/10 (TDPT)
Advanced Doctorate	
Other	
Certified Specialist	
Yes	3/10 (pediatrics)
No	7/10
APTA Member	
Yes	5/10
No	5/10

Table 13: Practice Characteristics of the Employees of the Practice

Characteristic	Practice Employees
Hours of work per week	
<20	3/10
20-30	2/10
31-40	3/10
>40	2/10
Patients per day	
<5	1/10
5-10	5/10
11-15	3/10
15-20	(1 response missing)
Percentage of time in patient care	
<25	
25-50	1/10
51-75	
>75	9/10
Setting	
Rural	
Urban	1/10
Suburban	9/10
Type of Facility	
School	10/10
Other	
No. of physical therapists at facility	
1	9/10
2-5	1/10
5-10	
11-15	
>15	
Type of condition for majority of patients treated	
Orthopedic	
Neurological	10/10
Cardiovascular	
Other	
No patient care	
Age (y) of the majority of patients treated	

Pediatric (≤ 18) Adult (19-64) Geriatric (65+) No patient care	10/10
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Document review data were also gathered during the planning phase. This included the Practice overview, strategic plan, yearly goals, staff meeting minutes, staff in-services, and continuing education courses attended by staff members, all during the three years prior to the initiation of this project. See Table 14 for a summary of the information gathered during the document review.

Table 14: Document Review

Documents	Pertinent Information
Practice Overview and Mission Statement	<ul style="list-style-type: none"> • Demographic information regarding Practice history, location, focus, number of employees, and philosophy regarding educational support for employees. • The overview states that the Practice “provides an opportunity for career training and growth, both internally and externally, through in-house training programs and continuing education stipends (for full time employees)” • The mission statement states that the Practice aims to provide “...an integrated and coordinated pediatric physical therapy program which includes clinic based, community-based, home-based, and educational-based services.”
Current Strategic Plan	<ul style="list-style-type: none"> • Specific mention of continued opportunity for career training and growth • Specific mention of expansion of services through strengthening relationships in the community, education systems, contract facilities, and general rehabilitation market • Objectives include: <ul style="list-style-type: none"> ○ To be the leading experts in delivery of PT services in education systems ○ Providing professional growth and development for all employees through in-service training programs, continuing education stipends, and opportunity for a variety of experiences
Records of staff in-services and	<ul style="list-style-type: none"> • In-services have been made available to staff on a wide variety of topics, especially during the 2003-2004 school year. However in subsequent years, staff meetings were limited to one meeting at the beginning of

meeting minutes	<p>each school year.</p> <ul style="list-style-type: none"> • Topics for in-services (date in parentheses): <ul style="list-style-type: none"> ○ “Alert” sensory-integration program (1/03) ○ Early Intervention Assessment (9/03) ○ Cardiopulmonary eval and treat (1/04) ○ Team building (3/04) ○ Evidence-based practice; Motor control/motor learning/ motor development (8/04) ○ PT Professional Issues (DPT, direct access, APTA vision 2020); also examination tests & measures (8/05)
Records of staff continuing education over the past three years	<ul style="list-style-type: none"> • Pediatric Neurodevelopmental Treatment • Pilates • Fitness for children • Pediatric Orthopedic Home Study Course • Motor Control, Motor Learning, & Motor Development • Medical Screening for Physical Therapists

Additional information from the document review revealed that the Practice is owned by one individual, a physical therapist, and was first established in 1984. The Practice has employed as many as 25 physical therapists at one time and provides services in an outpatient clinic site, numerous educational systems, homes, community living arrangements and adult training facilities. Sixty percent of the business is pediatrics and the other 40% is general physical therapy, including a focus on adults with developmental disorders. The mission statement for the Practice emphasized the provision of appropriate and excellent quality physical therapy that is cost-effective, as well as the provision of pediatric services that are integrated and coordinated within the context of the child’s life. In the Practice overview and current strategic plan, specific reference was made to provision of opportunities for employees’ career training and professional growth through in-house training and continuing education stipends. These stipends are only available to full time employees. Stipends for part-time therapists were available until 11/05.

Currently, the only full time physical therapist employee of the Practice is the owner- all other employees are part time. Seventy percent have a certificate or a bachelor's degree as their entry level physical therapy degree. Two of the respondents have gone on to receive an advanced master's degree and one has obtained a transitional doctorate in physical therapy (TDPT.) Two more respondents indicated that they intend to pursue an advanced degree and 80% reported attending at least one continuing education conference per year. Thirty percent of the respondents were board certified pediatric clinical specialists.

In addition to the Jette et al¹² survey and the document review, information was gathered during in depth interviews with the five participants, both individually and during a focus group interview. This information was all combined in order to further describe the Practice employees' current beliefs, attitudes, knowledge and behaviors with regard to evidence based practice. The five participants were chosen through a stratified, purposeful sampling process to reflect differences in years since graduation from a physical therapy program. These individuals were also identified by the Practice owner as likely to be interested in the topic of evidence based practice skills. The interviews were structured to elicit in detail, the attitudes, beliefs, and practices of these individuals with regard to evidence-based practice.

Practice Employees' Knowledge, Attitudes, and Beliefs Regarding Evidence Based Practice:

Table 15 summarizes the Practice employees' education and background relating to evidence-based practice. The participants reported that knowledge and understanding of

evidence-based practice was developed through a variety of sources. There was a contrast between individuals who graduated within the past five to seven years and those who graduated more than ten years ago in that the more recent graduates received instruction and training explicitly focused on the term “evidence-based practice” and its relevance to physical therapy practice. The recent graduates were more likely to point to their entry level education as a source for their knowledge and skills regarding evidence-based practice. Practice employees who graduated more than 10 years ago indicated that they did not receive explicit instruction in evidence-based practice during their entry level training. These individuals identified their own reading and interaction with others as resources for understanding this concept and developing related skills.

Table 15: Education and Background Relating to Evidence-based Practice: Percentage of Respondents who Strongly Agreed or Agreed with the Item

Survey Item	Practice Employees	Jette et al¹² Respondents
Learned EBP as part of academic preparation	30%	43%
Knowledge of online databases	40%	70%
Formal training in search strategies	40%	40%
Formal training in critical appraisal	50%	67%
Confident in appraisal skills	30%	55%
Confident in search skills	20%	65%

One of the participants, participant P, who is also the Practice owner, recently obtained her Transitional Doctorate in Physical Therapy (TDPT.) She received her entry-level degree in physical therapy over 20 years ago. However she indicated that her understanding of evidence based practice increased immensely as a result of completing the TDPT program. This individual has subsequently functioned as an important resource

for most of the Practice employees with regard to evidence based practice. Since finishing the program, she has become an even stronger advocate for the use of research evidence to aid in clinical decision making and most of the participants point to her as an important resource for the development of their understanding of this topic.

Despite the entry level training, individual reading, and efforts of the Practice owner, most of the Practice employees reported a lack of knowledge with regard to databases, search strategies, and critical appraisal. This lack of knowledge was also reflected in the low reported self confidence with these skills. For several of the participants, this lack of knowledge and confidence was a consistent theme during the interviews.

Participant K: “That’s very intimidating to me to look at different statistical analysis and to determine whether or not the article, if the research methods were good, and that is still very intimidating despite the fact of having a class (during entry level education.)”

Participant L: “I just feel like I need a lot more training in reading the research and actually interpreting the research, and applying it to situations.”

Participant R: “I don’t feel like I could look at different studies and say all right this is a better study, cause I just, I haven’t done enough research to know that- yeah, I’m familiar with that, but that was fifteen years ago (laughs) I mean, I don’t know, so you’ve got different studies that tell you different things, and they’re conflicting- they can be completely conflicting- so then you’re even more confused.”

In defining evidence-based practice, the participants focused on the potential application of scientific research to individual patients in daily practice and as a way to support or substantiate physical therapy practice. Evidence-based practice was also defined as a means of keeping abreast of current trends in the field and as such should be utilized by all physical therapists. The participants indicated that this represents an shift away from

doing things based on opinion or tradition and towards making clinical decisions that are based on the evidence and the research.

Participant L: “I think it’s using research- proven studies- and evidence to substantiate what we’re doing...to be able to say that if I do this, it’s gonna have a direct impact on what I’m trying and on my outcome.”

Participant A: “...to find out where physical therapy is going and what some of the newest and latest interventions, treatments are out there.”

Participant P: “I mean, you see, the research, actually I find it easier, because it’s not just some opinion out there, or because we always did it. You know I always hated that you know, well this is the way we’ve always done it.”

Table 16 provides a summary of the quantitative data gathered from the Jette et al¹² survey on items specifically identified as reflecting beliefs and attitudes toward evidence-based practice. The Practice employees had a positive attitude towards evidence-based practice and expressed a desire to increase their understanding and use of evidence based practice in daily practice.

Table 16: Evidence-based Practice Attitudes and Beliefs: Percentage of Respondents who Strongly Agreed or Agreed with the Item

Survey Item	Practice Employees	Jette et al ¹² Respondents
EBP is necessary	100%	90%
Literature & Research Findings Useful	80%	82%
EBP improves quality of care	90%	79%
Evidence helps in decision making	90%	72%
Using evidence places unreasonable demands on physical therapists	60%	61%
EBP will lead to increased reimbursement	0%	14%
Need to increase use of evidence in daily practice	100%	84%
Interested in learning and	100%	85%

Comments from the individual and focus group interviews further substantiated this finding regarding a positive attitude toward evidence-based practice. For example, all of the participants referred to the “importance” of evidence-based practice for the physical therapy profession. The construct of evidence-based practice was considered to be critical to “keeping up” with best practices in the field and to providing optimal services. The research evidence that supports clinical practice was identified as a valuable as a means to justify and provide rationale for physical therapists’ decisions to a wide variety of constituencies including parents, other educational team members, other physical therapists, and other health care providers. During the interviews, the participants indicated that the consistent use of research evidence to support decision making was critical for maintaining respect from other professions, likely to improve the confidence and skill of the practitioner, and likely to lead to improved outcomes for the children receiving physical therapy services. A frequent concept that arose during the interviews was that the use of scientific research evidence leads to more confidence with clinical recommendations and decisions.

Participant K: “I think the confidence is really affirmed whenever you can, whenever someone can say to you this is why, this is the decision that I think we ought to make, and this is why I think we ought to make it. And if someone can cite current research that backs it up...”

Participant L: “I think, for me personally because I can remember back when I was a student thinking, you know, who knows if this works. You know, how do we know this is working? I can remember thinking that and being excited when I would hear that there were studies going on. So, um, I really am attracted to that whole thing”

Several of the participants also alluded to the impact that using evidence may or may not have on patient/client outcomes and to a potential limitation of the impact of scientific research on clinical practice.

Participant A: "...if you don't, ah, if you don't know the evidence base, um, then you probably don't know what the best practices are, or what's going to be the most beneficial treatment for that child"

Participant L: "I mean we need, we need to know that, or at least I feel like I need to know whether what I'm doing is impacting this child in a positive way."

Participant R: "I mean even though yeah you could say percentage of time this works well with this kid, I mean every kid is different, and you don't know- they're just numbers, so you don't know, you're not guaranteed- okay well this research project says if I put you know, if I do this this and this with this kid, they're gonna be able to walk in six months- I mean there's no guarantee."

Application and Utilization of Evidence-based Practice: Current Status

The participants identified a number of current strategies relating to evidence-based physical therapy private practice. Ninety percent of the Practice employees have access to databases either at work or at home, and most of the participants reported using the internet to find evidence. This includes both research databases and the use of "Google" or other common search engines. Interestingly, only about half of the Practice employees reported having familiarity with search engines and the majority either disagreed with or were neutral toward the statement: "I am confident in finding relevant research to answer clinical questions." A similar percentage of Practice employees have had formal training in literature appraisal and again most disagreed with or were neutral toward the statement "I am confident in appraising the literature." Some of the participants also reported utilizing the resources offered by the professional organization (the APTA) as a resource for evidence based practice. These include email literature updates, professional peer

reviewed journals, and web-based resources such as the “hooked on evidence” page of the APTA website. As noted above, 50% of the Practice employees were APTA members. Finally, again as noted above, most of the interviewees reported that they rely on colleagues, and in particular the Practice owner, to identify pertinent research when an unfamiliar or challenging clinical situation arises.

Table 17 summarizes the current evidence based practice activities of the physical therapist employees of the Practice in comparison to the respondents from the original Jette et al¹² study. The Practice employees reported reading journal articles infrequently, along with infrequent use of database searches and research evidence to guide decision making. In addition, 60% of Practice employees indicated that their workplace does not support the use of research in practice. This lack of workplace support also emerged during the participant interviews. One example of this lack of support is that the Practice employees receive no financial support from their employer or from the educational system for attending continuing education conferences. The participants also discussed other examples of this perceived lack of support.

Participant K: “I know that there are certain environmental influences, and I work in very different school districts. I work in some school districts that are very supportive, and if you ask for something you get it, if you ask for support you get it. I work in another school district that, you feel like the related services are definitely on the back burner and they’re- you know you don’t get the support that you need...”

Participant R: “I think it’s hard, I think one thing that’s really hard about that though is there’s no reimbursement for that. You know if I can bill for a child on the IEP, say they get thirty minutes of direct and fifteen minutes of consult- well am I gonna spend all forty minutes looking something up? And you know that part’s very frustrating because it’s just not feasible you know, to do this. I don’t know how (other) therapists (do) it unless it’s just all extra on their own time doing it.”

Participant P: “The schools are hard. The schools, the school system is an institution, a public institution, so there’s issues there, you know any institution has its ways, and public education works on minimal standards. So its meeting minimal standards, so you don’t always have people who want excellence or who want change. You know, they truly don’t, so they’re very comfortable with the old way, or whatever. I mean they’re very resistant to change.”

Table 17: Evidence-based Practice Activities: Attention and Access to the Literature

Survey Item	Practice Employees	Jette et al ¹² Respondents
Read/review research literature (per month)		
1 article	60	17
2-5 articles	30	66
6-10 articles	10	13
11-15 articles		3
16 articles		1
Use literature for decision making (per month)		
1 time	30	25
2-5 times	50	49
6-10 times		18
11-15 times	10	3
16 times		5
Use MEDLINE or other databases (per month)		
1 time	60	65
2-5 times		30
6-10 times	30	5
11-15 times		
16 times	(one missing)	
Access to journals in paper form		
Yes	40	97
No	60	3
Access to databases at workplace		
Yes	60	65
No	40	35
Access to databases at home		
Yes	80	89
No	20	11
Workplace facility supports use of research in practice	40%	67%

Despite the use of these strategies and the overall positive attitude toward evidence-based practice, 60% percent of respondents reported reading one article per month, 60% reported using databases for literature searches one time per month, and 80% reported using the literature in decision making less than five times per month. During the individual interviews, the participants were given an opportunity to rank themselves as evidence-based practitioners, with a one being a “poor” and a 10 being “optimal”. Three ranked themselves at a three or lower, while the Practice owner and one of the more recent graduates both ranked themselves at a seven or eight. All made clear, however, that they viewed themselves as having a long way to go with regard to knowledge relating to evidence-based practice, and all expressed a strong desire to improve in this area.

Barriers

In addition to the lack of support from the workplace, a number of other barriers to evidence based practice were identified. Six out of 10 Practice employees identified lack of time as one of the top three barriers to the use of EBP in their clinical practice.

Additional barriers identified by these individuals included lack of understanding of statistical analysis (50%), lack of information resources (30%), inability to apply research findings to individual patients with unique characteristics (40%), lack of research skills (30%), lack of generalizability to patient population (20%), poor ability to critically appraise the literature (30%), and lack of collective support among colleagues at workplace (10%). None of the Practice employees cited “lack of interest” as a barrier to the use of EBP in their clinical practice.

Comments during the interviews reflected a similar emphasis on the lack of time and general lack of knowledge and skills relating to EBP as significant barriers.

Participant L: “The glitch comes with the time, for me. Because it just seems like there’s never enough hours in the day to, to you know get into the research and to you know find things and to be able to learn them well enough to then implement them, um, or even trying to do conferences during the school year, you know, has been a challenge for me these past two years.”

Participant K: “I did learn about evidence based practice in school, um, but once, once I ah, got away from academia and I don’t have that access through the university system any more to Medline I think now it’s like an abbreviated access you have whenever you don’t have affiliation with an institute of higher learning. So it’s a lot more difficult, I think, for people to get their hands on that type of research.”

Participant R: “The other thing for me when I do look at research, sometimes it doesn’t make sense just to put it right into practical use...”

Another consideration is participants’ perceived lack of interest or knowledge about evidence-based practice among their physical therapy colleagues. During the interviews, the participants expressed their thoughts about their colleagues and the ways in which these individuals utilize and apply evidence-based practice. This provided a general sense as to the participants’ perceptions about the current status of evidence-based practice in pediatric physical therapy, especially in the educational setting.

Participant K: “People that graduated before me I think are having a difficult time with the whole importance of it, and very intimidated by the whole idea.”

Participant K: “Well I do have some friends that are pediatric physical therapists as well. I feel a little less confident in using their advice because I know that they’re even less into evidence-based practice than I am (laughs).”

Participant P: “I’m not trying to be negative towards my colleagues or anything, but you know I see a lot of, just doing, you know the same goals over and over again, the same, seeing, you know weekly over and over again, and there’s no

change and there's no real direction. It's almost like they're gonna get therapy until they're 18. That's you know, just the way it is."

Influences on Clinical Decision Making:

Finally, although the participants had a positive attitude toward evidence-based practice and the use of research evidence to support clinical decision making, a number of other factors constrained and influenced clinical decisions in the educational setting. The participants identified a multitude of these factors during the interviews. For instance, the input and goals of the child and family, the school environment, the skills and knowledge base of the teacher and classroom staff, and the skill level of the child based on a physical therapy examination are all described as critical elements for decision making.

Participant L: "(Decisions are) based on many factors- experience of the people that are going to be working with that child, the experiences of the school staff, views of the school staff..."

The response of the child to intervention is another important factor. This includes the progress, or lack thereof, for the child. Also important for decision making was a "trial and error" process when working with children. An example of this was altering or updating the intervention activities on a regular basis in order to maintain the interest and motivation of the child.

Participant R: "And then the other thing I think is trial and error. You know you try something, you see a problem, you say okay we're gonna try this, and then if it doesn't work, okay that's not solving it, now what else can it be."

Along the same lines, an important influence that may be unique to these individuals was practice in the educational setting, where physical therapy is a related service. As such, the primary focus is on the child's educational goals, and the role of physical therapy is to support that process. Therefore the physical therapy goals and intervention program are limited to those activities that are agreed upon by the child's education team. The program must occur within a child's particular educational curriculum and be feasible in a school environment. Decision making in this setting was often strongly impacted by those constraints.

Other influences on clinical decision making included interaction with colleagues such as physical therapists working in similar settings or with advanced clinical experience, along with other professionals at a particular workplace. This influence became even more powerful when these colleagues or other professionals were able to reference scientific research in their advice or responses to clinical questions. Information gathered from continuing education conferences also served as an important resource for decision making, as did information from equipment vendors. The more recent graduates also referred to the knowledge and skills amassed during entry level education as important decision making influences as well. Finally, the participants who graduated more than 10 years ago frequently referred to their own clinical experience as an important decision making influence.

Participant R: "Pretty much my decision making is based on past experience, what's worked with kids, what hasn't worked with kids."

Despite these multiple additional influences, the participants also referred to the use of research evidence as a consistent element of clinical decision making. Several described specific referral to a research article or to “research” in general when asked to provide rationale or justification for a course of treatment. An example was the use of research on energy expenditure and its impact on school performance to support a recommendation for assistive device or wheelchair for mobility in that setting. Research evidence also drove the choice of valid and reliable tests and measures during the physical therapy examination. The research available on the benefits of a standing program or on the effectiveness of an exercise regimen may be used to encourage classroom staff to implement the program. Finally, prognostic and other background information on a particular diagnosis and gathered through searches for evidence was also an important source of information for clinical decision making.

Suggestions for Improvement:

Specific strategies for the acting phase of this project were made at the conclusion of phase I. However, during the interviews the participants did provide some suggestions for improved use of research evidence to guide clinical decision making. These included continuing education courses or workshops focused on training in evidence-based practice skills. The outcomes of the workshop would include an improved ability to implement efficient search strategies and then interpret and apply research to practice. Along the same lines, encouraging practitioners to return for a TDPT and ensuring that instruction in evidence-based practice is included in all TDPT programs was suggested. Another suggestion was for the professional organization to identify and summarize

important research and then make this available for its members. A common barrier for all respondents was a lack of time. Therefore any way to reduce the time requirement and improve the efficiency of evidence-based practice activities is extremely important. The same theme emerged in the suggestion that practitioners need instruction and information on strategies that can be efficiently utilized on a consistent basis. Finally, advocating for the school setting to increase recognition for the importance and value of evidence-based practice activities was also identified as potentially leading to therapists' improvement in this area.

Participant K Case Report
Demographic Information:

K has been employed by the Practice for three years. Prior to that, she worked in an outpatient orthopedic setting for three years following graduation. She received her Master's Degree in Physical Therapy (MPT) approximately six years ago. At the time of this project, K was employed part time, due in part to the fact that she is the mother of a small child. She worked approximately 20 hours per week, primarily in elementary schools but also in a private school for children with disabilities. The number of children on her caseload, which includes a variety of both consult and direct service, is 28. These children range in age from three years to approximately 14 years old, with a wide variety of diagnoses and levels of ability. Although K was a member of the American Physical Therapy Association at one time, she is no longer a member. In addition, over the past year she had not been able to attend any continuing education courses.

Clinical Decisions:

K identified a number of clinical decisions that she is faced with on a regular basis. One of the most challenging and frequently occurring decisions is determining the level of service for a child. K described the difficulty in deciding when to provide direct services, a more intensive approach where she provides individual one on one intervention, versus a more consultative, less intensive approach, when she functions mainly as an educator for the child's classroom staff and caregivers.

“...when exactly is the right time to try to back off a little bit, and allow the child to function in a less restrictive environment, when you're not pulling them out or pushing into their gym class...It's like letting go- when do you let go?”

K alluded to this challenge frequently during the interview. Other common clinical decisions included the types of assistive devices to recommend and use, especially in an educational environment, as well as the challenges of working with children who are more severely involved.

Influences on Clinical Decisions:

In discussing the ways in which she makes clinical decisions, K identified several important influences. Working in an educational setting imposes a number of constraints on decision making. These include such factors as the amount of space she has to work with, the equipment available to her, and the time she has for each child. The amount of space is frequently too small or otherwise inadequate for a large number of clinical examination and intervention activities. Most of the equipment that K utilizes is limited to what she can transport in her car and into and out of the school building. K is also on a very tight schedule, both for her daily routine and for each child on her caseload. There is

little opportunity to alter the treatment session in a trial and error fashion while it is ongoing, due in part to the limited time available.

“Probably time. Time is the biggest factor and, you know I do have a very tight schedule. I have to be at different schools at different times and I don’t have down time built into my schedule at all.”

“I am basically limited to what I can carry in myself for that kind of stuff. So that’s a little bit limiting too if you’re in the midst of a treatment session and you plan to use these certain pieces of equipment and then you realize that, ah, for whatever reason it’s not working, you don’t necessarily have the time to run, even run back out to your car to the trunk to get whatever else and then bring it back in and use it, so, that’s a, that’s a consideration as well.”

“working in the school, space is a factor too.”

An additional constraint in the school system was the IEP process. While K does have some input into the annual goals for the children on her caseload, as a related service provider, she is one member of a team of individuals responsible for the development of the IEP. As such, it occasionally does occur that a child is assigned specific gross motor goals and/or a physical therapy program with little input or perhaps even disagreement from K. It then becomes her responsibility to implement a program which K believes may not be the most appropriate or effective approach for a particular child.

“There are so many things that go into making a decision like that and sometimes if you have a parent that is very adamant that their child receives services, you know you talk to the teachers, you talk to the parents, you tell them what your thoughts are and sometimes the school district thinks that it’s worth, you know going to bat for and sometimes the school district doesn’t.”

Within these constraints, K based her decisions on the clinical presentation of the child and the goals of the child and family, and relied on her own experience and knowledge base initially. In addition, she looked to other team members in the educational setting

such as the classroom and gym teachers to assist with clinical decisions. When she encountered situations that were problematic or unfamiliar, K often turned to colleagues- other pediatric physical therapists who are more experienced.

“If I encounter something that ... maybe I haven’t seen so much in the past, or something that might be new or different to me, then I’ll typically seek out the advice of my colleagues...”

“...so, I would ah, probably use my contacts most- you know other physical therapists that have a lot more experience than I do. Draw upon their experience first.”

During intervention sessions, K described a trial and error process whereby she’ll attempt to integrate a new activity or piece of equipment and then evaluate the effectiveness of that approach. K also described an ongoing effort to regularly change her interventions in order to avoid complacency and boredom on the part of the child. The nature of physical therapy provision in the educational setting is such that the therapist is likely to work with the same child for at least an entire school year. As such, it is critical for both therapist and child that the therapeutic activities be engaging and motivating. K alluded to this frequently as an important influence on clinical decision making.

“I have different equipment that I carry with me, and every once in a while I’ll even get sick of playing with it- since I do it more than the kids do (laughs). So I switch that out and bring other stuff out, and that kind of thing, and try to keep things fresh in that way.”

“I think it’s probably easier to become complacent working in the schools because you see the same child year after year, and, you sort of have a typical...you know in your mind you sort of realize, you know, this is the way they respond in the past and this is sort of the way you expect them to respond in the future.”

Knowledge, Attitudes, and Beliefs Regarding Evidence Based Practice:

K discussed the importance of evidence-based practice activities to aid in her clinical decision making. Much of her knowledge about evidence-based practice was obtained during her entry-level education.

“We had- a class that was added that was based, we had a research class and then we had an evidence based practice class where we would, you know review current articles...”

“It was heavily stressed in school, and I am fortunate that I was a part of a program that was able to do that.”

“At least I’m familiar with it, and the importance was stressed from the very beginning.”

This was also supported by K’s responses to the Jette et al¹² survey items that reflect knowledge and skills. K agreed that she has received formal training in finding and critically appraising research. Despite this formal training, K lacked confidence with her ability to find and critically review research to answer clinical questions. She indicated that her search skills were “rusty” and that a lack of understanding of statistical analysis was a significant barrier for her.

K had a positive attitude toward evidence-based practice and viewed this as a valuable aspect of her clinical practice. In addition, on the Jette et al¹² survey, K indicated agreement with items that reflect a positive attitude.

“...but then you know also when you have specific questions about specific treatments, um, I think it’s a good idea to be able to use a search, a medical data base to search, you know for the different, the newest research that’s out there...”

“If you can really point to something concrete to justify it, it makes you seem more confident, more learned, more able, you know, I would definitely feel much more comfortable being that confident.”

Application and Utilization of Evidence-based Practice: Current Status

On the Jette et al¹² survey, K indicated strong agreement with the statement “I need to increase the use of evidence in my daily practice.” Her reliance on input from colleagues and on her own experiences both constituted a use of evidence to guide clinical decision making. K relied heavily on the owner of the Practice to assist with decision making and to provide information from scientific research articles that may have some relevance to a particular clinical circumstance. K has regular phone contact with the Practice owner, whom she described as a “huge proponent of evidence-based practice.”

“...for anything that comes up in my practice that I don’t have an answer to or that I need clarification- I can always call her and she’s always there.”

“She is now a huge proponent of evidence based practice, seeing the change in the responses to her from my questions, was in the past year. I’m getting a lot more answers that are based on evidence, rather than based on her anecdotal experiences. So I think that that’s kind of where I’ve started, from pulling, pulling from the things that, you know, she doesn’t just call me up and say hey K, the latest evidence is this. She relates it to any difficulties that I’m having or any problems that I’m having, so really I’m using her as my resource at this point.”

K described other evidence based practice activities that she utilizes, although somewhat less frequently than discussions with the Practice owner. According to the Jette et al¹² survey, K read one article per month and did a Medline or database search once per month. She used research findings for clinical decision making two to five times per month. K occasionally used the internet, mainly for background information or for clarification of an unfamiliar diagnosis.

“...probably more for clarification of um, diagnoses. I mean there’s so many different syndromes and things that you just can’t possibly encounter everything, or remember everything, even if you did learn it once back in school.”

In addition, she described weekly email literature updates from the APTA that assist her to identify important articles. Finally, she briefly discussed the use of equipment catalogues and vendors/suppliers as another source of information to assist with clinical decision making.

K discussed a strong willingness to update her practice by incorporating new clinical activities, especially when these activities are based on scientific research articles.

“No I’m very eager to try new things. I really do, you know when you’re talking about evidence based practice. I really see the value in that, and I really, am very anxious to incorporate that into my practice.”

She strongly valued this type of information and found it helpful when providing justification for clinical decisions that may be resisted by other members of the educational team. In addition, this type of evidence allowed her to keep abreast of the current trends in the field and enhances her confidence with her clinical decision making.

“If you can really point to something concrete to justify it, it makes you seem more confident, more learned, more, able, you know, I would definitely feel much more comfortable being that confident.”

Despite this strong belief in the importance of evidence-based practice, K identified several struggles with implementation of these principles. When asked to rank herself on a scale between one and 10, with a “one” being essentially not evidence-based at all, and a 10 being an optimal evidence-based practitioner, K placed herself at a two. She expressed some disappointment regarding the fact that she relied so heavily on the Practice owner as a resource for evidence and indicated that she really does not use evidence or evidence based practice as much as she should.

“When it comes to being proactive- to going out and finding the information myself, I’ve been very lazy about it and I haven’t done it. So, I’d give myself maybe a two.”

K alluded to a number of challenges and barriers that hinder her ability to use research evidence in clinical practice. One was that she no longer has the same level of access to various databases that she had while in her entry level physical therapy program. Also, she stated that her search skills are now “rusty,” and that although there may be good information available, she was not sure what to look for or how to find it. As an example, the last time she attempted a Medline search, approximately two years ago, the search “did not work out well” because she was not able to find what she was looking for. She also described herself as being intimidated by statistical analysis and uneasy with making the determination as to the quality of a particular research article. Finally, the application of evidence may also be somewhat of a barrier. First, K indicated that she has not experienced a significant change in outcome or progress for a child when she has attempted to integrate a new activity, based on information from a research article, into her practice. In addition, the school districts and the educational environments where she works may not be supportive of new or innovative approaches to physical therapy intervention.

Despite these challenges, K was strongly motivated to enhance this aspect of her professional practice.

“When I first got into pediatrics, I really did try to take in as much as possible, and I really tried to do that, and I’d like to get back into that because I was able to fit it in then, and that was something that I did on my own time and was able to find the time to do so. I would like to be able do that again.”

She would like to bridge the gap between what she learned in her entry level education and where she is now in her professional career. Several of her suggestions for improvement related to the need for some sort of summary or clinical guidelines based on the most pertinent evidence, perhaps from other colleagues and/or from the pediatric section of the professional association. Ideally, evidence-based practice activities should be incorporated into a weekly routine. She also alluded to the need for employers, specifically school districts, to recognize the importance of these types of activities. Presently these school districts reimburse physical therapists only for the time spent with the child- any other activities must be done on the therapists' own time. She closed the interview indicating a need for "some solutions," and expressed gratitude that this current research project is designed to develop and implement some possible solutions to this problem.

Participant P Case Report
Demographic Information:

Participant P is the owner of the Practice. She has been a physical therapist for 25 years and has been working in pediatrics for the past 21 years. Her entry level degree is a Bachelor's in physical therapy. She went on to obtain an Advanced Master's Degree with an emphasis in neuroscience, and more recently a Transitional Doctorate Degree in physical therapy (TDPT). She is a board certified pediatric clinical specialist and has maintained membership in the American Physical Therapy Association throughout her career. P carries a caseload of approximately 30 children, mainly in pre-school and school settings, in children's homes, and also in her outpatient clinic. She reported that

she works > 40 hours per week. The interview took place in her office, during a break from her daily work related activities.

Clinical Decisions:

In describing her daily clinical decisions, P focused on the data that she gathers for the examination and ongoing evaluation process. She emphasized the importance of the patient's history, and of her own experience and knowledge, both of which allow her to zero in on a minimal number of key, objective tests & measures. The child's performance on these tests & measures then leads to the development of outcomes for the child and to regular, ongoing evaluation of the child's progress.

“...not only do I make decisions initially, every time I have interaction with that child, I'm re-assessing, re-assessing what's going on and making decisions...”

P also alluded to the importance of a comprehensive examination which emphasizes the ways in which the child is able to function and accomplish activities during his or her daily routine. In addition, she is not restricted to a narrow focus on the child's problem area, but instead utilizes a screening process during the examination to identify other potential areas of concern. Finally, during decision making, P tended to rely on observation and communication with the child and his or her caregivers, in contrast to a previous tendency to employ a “hands on” approach to her practice. She relied heavily on the use of home programs and school programs that emphasize fitness-related activities such as strengthening and aerobic exercises. As such, it is critical that she works closely with the child's parents, teachers, and classroom staff to implement and monitor these programs.

“I put them on programs at home and I do a tremendous amount of strengthening, bike riding, stationary bikes, treadmill...”

“...the focus now is really on strengthening and fitness levels and we do a lot with endurance stuff, fitness, ... so I set them up on programs and I give them grid sheets- I have these grid sheets that I use...”

Influences on Clinical Decisions:

There were a number of important influences on P’s clinical decision making. To a great extent she is influenced by her interaction and communication with the child and his or her caregivers and teachers to determine appropriate examination tests & measures and to establish goals and outcomes. As part of the ongoing evaluation process, she communicates regularly with these individuals to monitor and update the intervention activities. In addition to this communication, P also emphasized the importance of objective data collection to aid in evaluation of the child’s progress. As noted above, these objective tests & measures are frequently related to some aspect of the child’s overall fitness level, such as strength or cardiovascular endurance.

P frequently alluded to differences between her practice of a few years ago and her current physical therapy practice. In a similar way, she also contrasts her current practice with her perception of the practices of many of her colleagues in pediatric physical therapy. P’s current practice is more dependent on communication and listening to what the child’s problems are while consciously attempting to avoid pre-conceived biases or notions regarding the focus of her examination and intervention.

“...what is important to this child and this family and the teachers? You know if I’m very focused on evaluating what they’re, what they need, and how they see

physical therapy assisting them, as opposed to going in there with a pre-agenda, and a ... a cookbook type approach,..."

Previously, she utilized a more developmental approach with a focus on improving the child's gait pattern, for example, rather than listening to the child and family to determine when and where physical therapy might be most beneficial to improve the child's function. With her current emphasis on developing programs that are mainly carried out by others, she now focuses much of her practice on communication throughout the process, from initially identifying the most appropriate activities, to instructing the child and caregiver on implementing the activities, to monitoring, evaluating, and updating the activities as needed.

P's completion of a TDPT program had a profound impact on the recent changes in her clinical practice. She frequently stated that the TDPT has had a "huge" impact on her professionally. As noted above in her demographic information, P has strongly embraced the notion of lifelong learning throughout her career. She regularly attends continuing education conferences and has obtained both an advanced masters degree and board certification in pediatrics. However, completing the TDPT program appears to have led to the most significant changes in her approach to clinical practice.

"...since I've gotten my DPT, and I'll keep referring back to that because that made a huge difference for me, I no longer see things as difficult or challenging, I just I see everything that, it's, I know, I just take it one step at a time because I don't have expectations per se any more or pre conceived notions, any more. I'm there to serve that patient to the best of my ability as a therapist and to meet their needs."

"...the DPT also gave me tools on how to work with other individuals because you know you're learning to manage somebody's care, not so much doing that

hands on one on one. So you're really learning to work with lots of people and to explain your position and to do it in a way that's very effective. You know, probably my communication skills I guess then you would say are much more... but then they gave me the tools to do that."

"...that's one of the things in the DPT, a hallmark of the DPT, is that you're managing that patient's care and that you're constantly making decisions."

Along with a change in her approach to practice, the TDPT has also led to a renewed emphasis on the use of research to inform decision making. P reports that the TDPT program provided the "tools" to be able to efficiently use the internet to access information and research evidence. P regularly uses the results of research to inform and support clinical decisions. She has access to the internet in her office, and is therefore able to obtain and utilize evidence gathered from internet searches as a routine component of her interventions and communication with her patients and their families. She also reported that she uses research evidence to inform decision making regarding choices of valid and reliable tests & measures along with the most appropriate interventions for children with a specific diagnosis and/or set of circumstances.

Knowledge, Attitudes, and Beliefs Regarding Evidence Based Practice:

It is not surprising that P is a strong proponent of the use of evidence and evidence-based practice for physical therapists. She defined evidence based practice as "...making clinical decisions and evaluating based on the evidence and the research and not based on what you think is good and what has been done all along." She described this process as an effort to synthesize and evaluate objective research and to infer the results of this research to drive decision making. P believes that evidence based practice is critical so

that physical therapists, and especially pediatric physical therapists, are able to continue to maintain respect from other professions. She expressed some concern that this approach has not been adopted by some of her colleagues in pediatric physical therapy, and that this has led to sub-optimal practice.

“And so if we want to continue to maintain respect from other individuals, and respect from other professions, I think you need to um, change your way.”

Responses on the Jette et al¹² survey further supported this positive attitude toward evidence-based practice. P indicated strong agreement with the items that reflect a positive attitude, including research literature being useful in day to day practice and helpful with clinical decision making. P also has had formal training in finding and critically appraising research literature, and indicated that she is confident in her ability to implement these skills.

Application and Utilization of Evidence-based Practice: Current Status

P frequently alluded to the impact that this renewed reliance on research evidence has had on the effectiveness of her clinical practice. She identified a much higher level of confidence with her decision making since completing the TDPT. Her examination and intervention skills are much more efficient and focused, and as a result she feels that the outcomes she is able to achieve with her patients have significantly improved. One example was the shift in emphasis toward strengthening and endurance. This was due in part to the research evidence she has gathered on these issues. As a result of this shift, P has had teachers report to her that the students receiving these types of programs are no longer as limited by fatigue, either at the end of the school day or during community field

trips and related activities. These types of improvements have reinforced the use of evidence to support and guide decision making.

P identified a number of different activities that she utilizes to stay abreast of current research. She viewed these efforts as essential elements of her professional practice and frequently alluded to the importance of being committed to these types of activities as a professional. Her membership in the APTA and in the pediatric section have both been critical to her ability to access research journals and other types of research evidence. These include the pediatric section list serve and the APTA's "hooked on evidence" section of the website. She rarely uses textbooks as a resource, and instead tends to rely on the internet for background information on various diagnoses. She reads research articles two to five times per month and utilizes database searches six to 10 times per month. P regularly uses professional literature and research findings in the process of clinical decision making, reporting that this occurs between 11-15 times per month.

P ranked herself fairly highly as an evidence based practitioner (8/10) and also expressed the belief that she still has a long way to go and much to learn in this area. However she also spoke of several barriers or challenges relating to evidence based practice. The educational system functioned as one barrier. P believed that there is often little motivation or reinforcement from school administrators for the extra time and effort necessary to improve one's skills and practice.

"There's a lot of other things I could do, but when they're not appreciated or you put all this effort into it and nobody cares, and then you wonder you know is it worth it."

Also P did briefly mention the challenges of accessing and utilizing research databases because of limited time. According to the Jette et al¹² survey, P ranked time as her most important barrier to the use of evidence-based practice in her clinical practice.

“I haven’t figured out yet how to run a business, carry a full caseload, and take care of two kids”

For the most part, however, P expressed a strong commitment to the notion of evidence based practice and using research to guide decision making. She indicated that this commitment is critical for continued professional growth, both for her and for the practice of pediatric physical therapy in general. She also perceived this continued growth as being essential to improving the outcomes for the children receiving physical therapy services. Therefore a critical component of this ongoing growth is the commitment to using research on a routine basis to inform and support decision making.

Participant A: Case Report
Demographic Information:

A was interviewed in her home at approximately 7:30 pm after a busy day which included some additional home care visits following her “regular” job working in the school setting. She has approximately one year of experience as a physical therapist after graduating from an entry level Masters in Physical Therapy program in 2005. She is not an APTA member. She reported working > 40 hours per week, mainly in schools, with a daily caseload of about 10-15 children, although she occasionally also provided home care physical therapy for adult clients. Her current primary work setting, a designated private school for children with disabilities, employed other physical therapists. A also provided physical therapy services in several public schools.

Clinical Decisions:

A reported that the majority of her daily clinical decisions were related to the hands-on treatment activities she implements with each child on her caseload. A typically focused on the effectiveness of her treatments, and regularly re-evaluated the progress and response of the child in order to determine whether to continue or revise these treatments. A also described the initial presentation of the child, and his/her response to A's treatment as being important influences on her clinical decision making. She described an initial assessment process aimed at identifying the child's strengths and needs, along with any physical therapy activities that have worked, or not worked, in the past. She characterized her decisions regarding intervention activities as somewhat based on "trial and error," depending on the child's behavioral response and progress toward achieving goals.

"When I first see a patient like I'll assess them and then I'll determine what types of needs I feel they need to increase..."

"I kind of look back through the evaluation and see if they have ever had any type of physical therapy before- like what's worked, what hasn't worked..."

Influences on Clinical Decisions:

Along with the response of the child, there were several other important influences on clinical decision making for A. The clinical decision making process she utilized was dependent on interaction with physical therapy colleagues. A frequently occurring activity for A was to discuss with these colleagues what they have had success with, and what has not been successful, with regard to a specific child, diagnosis, and to their overall effectiveness as physical therapists.

“I will ask another therapist in the district who has already seen this child before, through this other PT’s caseload, because most of the school’s I’m in there’s another therapist in that building. So it’s easy for me because they see that child every day, so I’ll ask them like their advice.”

“...what types of treatments that they’ve used on you know that kid before or another child of the same disability, that has the same types of difficulties.”

Information shared by colleagues following their attendance at a continuing education conference provided an additional source of information for A. She makes use of other team members including the occupational therapist, the teacher, and the parent. These resources were often utilized specifically for behavioral or psychosocial issues. Vendors who present on new or unfamiliar pieces of equipment provided important information to aid in clinical decision making. A also frequently referred to her entry level education as having a strong influence on her clinical decision making.

“...what’s in the text books, what my professors have told me.”

“I’ve emailed my professors before at to see you know (what) they would do in this scenario.”

“I look at my old text books because they’re still fairly new because I’m a new grad...”

Knowledge, Attitudes, and Beliefs Regarding Evidence Based Practice:

A defined evidence based practice as taking research and applying it to a patient.

“But it’s also to figure out how to take a case that may be in a journal and generalize it to one of your patients that you’re actually seeing or seeing how that worked for the patient, how could that possibly work for somebody that you’re seeing?”

A described a strong emphasis on evidence based practice during her entry level education. This is where she developed her knowledge and skills in this area. According

to the Jette et al¹² survey, A was very confident in her ability to search for and critically appraise research literature.

“...the concept of evidence based practice was talked about a lot when I was in college and, a lot of schooling was based (on) evidence based practice.”

A believed that evidence-based practice is critical for the profession of physical therapy. On the Jette et al¹² survey, A indicated agreement with each of the items that reflect a positive attitude toward evidence-based practice. In part, her attitude toward evidence-based practice was due to several sub-optimal interactions with more experienced colleagues who according to A were not utilizing up to date intervention approaches and were not using research evidence in their daily practice. A was a proponent of mandatory continuing education that is evidence based, and also felt that additional training should be provided to those individuals who are not comfortable with accessing research through the internet and analyzing the strength of that research. According to A, the use of research evidence will help to ensure that all physical therapists are up to date with “best practices” and therefore that each patient is receiving optimum benefit from physical therapy.

“I think it’s extremely important because...therapy changes. Some of the things that, I’m sure some of the strategies for somebody who’s been working 15 years probably still work, but I don’t know if that’s what best practice is, you don’t know that”

“If you don’t, if you don’t know the evidence base then you probably don’t know what the best practices are, or what’s going to be the most beneficial treatment for that child.”

Application and Utilization of Evidence-based Practice: Current Status

A reported that she regularly relies on information from research articles to aid in clinical decision making. She used information from journal articles when she has access to them. She reported reading one article per month and performing six to 10 database searches per month. She used professional literature two to five times per month in the process of clinical decision making. Her entry level education provided her with the skills to analyze whether the results of a particular article are applicable to an individual patient. Although A did not have internet access in her home, she was able to access various internet resources during her work day through the school library. She reported some success with utilizing the APTA website, along with other resources such as Medline and CINAHL. Her use of the internet and recent research has led to updated treatment activities and improved understanding of unfamiliar diagnoses.

“I’ve probably just used what I’ve learned to be able to use the resources that I’ve been taught how to use, mostly the internet, or some journal articles that we may have at work, you know through APTA...”

“...when I did have access to the APTA, I used their APTA website, and I’ve also used Medline, CINAHL”

Although A felt very strongly about the importance of evidence based practice and keeping up to date professionally, she was not able to attend any continuing education conferences since her graduation due to both financial and time constraints. She ranked herself at a seven (on a zero to 10 evidence based practice scale where zero is “not evidence based at all” and 10 is “an optimal evidence based practitioner”) and stated that she would definitely like to be at a 10. A is reasonably pleased with the success of her efforts regarding evidence based practice thus far. She indicated that along with continuing her current activities, she will make an effort to attend a continuing education

conference in the coming year and is planning on returning to obtain a Doctorate in Physical Therapy (DPT) within the next two-three years.

On the Jette et al¹² survey, A identified lack of information resources and insufficient time as the two most important barriers to the use of evidence based practice in her clinical practice. She also does not belong to the professional association, which she identified as a barrier. As identified above, her lack of access to the internet at home and lack of financial resources to attend continuing education conferences were also identified as barriers to evidence-based practice.

Participant R Case Report
Demographic Information:

R received a bachelor's degree in physical therapy 19 years ago. She spent the first 10 years of her career in an adult acute care and outpatient setting. She has been working primarily in a pediatric setting for the past four and one half years, and currently spends the majority of her work week, approximately 32 hours, in the school setting. She also spends a small percentage of her time in a pediatric rehabilitation center and in home care, and her weekly caseload is about 25 to 30 children. R is currently not a member of the American Physical Therapy Association (APTA), although her husband, also a physical therapist, is an APTA member. The interview takes place in R's home, in the early afternoon just after she has returned home from work that day.

Clinical Decisions:

In discussing typical clinical decisions, R focused on "figuring out" the best approach to help a particular child. An example was the application of different pieces of equipment

or orthotics when the original approach was not successful, such as the choice of a different type of thoraco-lumbar-sacral orthosis (TLSO) to assist a child in maintaining upright postures. Some additional examples of clinical decisions included whether to discontinue direct services for a child, the use of vestibular exercises for a child with deficits in this area, and varying treatment activities to maintain the interest and motivation of the children on her caseload.

Influences on Clinical Decision Making:

There are several important influences for R when going through the clinical decision making process. A consistent and important theme for her was that she greatly values input from other professionals. In the educational setting, since often there are no other physical therapists present, R works most closely with other professionals, especially occupational therapists and the adaptive physical education teachers. She described frequent problem solving and collaboration with these individuals.

“...consulting with other professionals that are there with me- whether it be physical therapists, or in some cases, in certain schools there’s only an OT, you know, or O & M, so just talking also with other health care professionals.”

“I worked very closely with the phys ed teacher, and that was really helpful because I saw the things that she did and got a lot of ideas from her, and that, that was probably the most helpful thing is that some, some of the phys ed teachers really give you some good ideas- especially the ones that are working with special needs population.”

R also does rely on the Practice owner for assistance with decision making in this setting. In addition, she works part time (approximately five hours per week during the school year and more often in the summer) in a pediatric rehabilitation hospital and greatly valued the contact and interaction she has with the other physical therapists who work there.

“...in that case it’s actually very easy- you just go up to any PT and say I have this kid and she just got these DAFO’s and she’s just not walking right and I’m not sure they’re right for her, could you look at her walk and see what you think, you know, it’s nice when there’s a bunch of PT’s there and anybody that’s sitting there... and they do the same thing and when they ask you questions then that makes you think and can bring up discussion in the room which I find very helpful.”

Along with interaction and collaboration with other professionals, R relied on her own past experiences in working with children. Interestingly, despite having been licensed as a physical therapist for 19 years, she only has four and one half years of experience working in pediatrics. This lack of pediatric experience has presented a challenge for R, especially since she reported that she received little formal mentoring in pediatric practice.

“I worked at (a local hospital) for 10 years before I went into pediatrics, so, I was like a new grad, but not treated like a new grad- I was treated like I knew exactly what I was doing. And there have been a lot of self taught things in pediatrics, which is a shame, because I kept thinking when you start a new job as a new grad, you have a mentor that’s with you all the time and you just get all this feedback and you really learn a lot about what you’re doing. And then when you, it’s almost like totally switching careers- you know going from rheumatology and outpatient orthopedics to pediatrics in the school setting, you know, and it was really, it was tough at first and, I kept asking (the Practice owner)- you know what do I do, what do I do? And she’s oh you’ll know what to do- I will? (laughs). So a lot of it was self taught.”

Nonetheless, she reported that her own experiences, often based on a trial and error process with the children on her caseload, provided an important resource for her in making clinical decisions each day.

“I would probably say past experience would be the most... you know I’ve seen this before, I’ve tried this, this, and this. This was most helpful, let’s try it this way.”

R frequently alluded to a need to come up with new treatment ideas when challenging situations arise and to minimize the potential for boredom on the part of the child. As noted above, she frequently employed a trial and error process.

“I think what really, I guess, moves me along is that the kids start getting bored”

“And then the other thing I think is trial and error. You know you try something, you see a problem, you say okay we’re gonna try this, and then if it doesn’t work, okay that’s not solving it, now what else can it be.”

R was likely to consult with colleagues and implement their suggestions, especially if the colleague was perceived to be more experienced or knowledgeable about a specific situation.

“If I run into- I wonder why this isn’t working, or, you know, I don’t have any ideas, then I can, you know, I can call someone and see what is going on.”

She also identified interactions with physical therapy students and the use of equipment catalogues as important resources to aid her in developing new treatment ideas. Another potential source of information comes from continuing education conferences, although she has been unable to attend any conferences during the past year due to limited time and financial resources.

Knowledge, Attitudes, and Beliefs Regarding Evidence Based Practice:

R valued the importance of research evidence for assistance with clinical decision making, especially in situations that were challenging, or perhaps when the therapist was “in a rut” and having difficulty finding new treatment activities for a particular child. She defined evidence based practice as, “using research in your daily practice...actually using real research studies to help you make your decisions.” She indicated that she had little training or instruction in evidence based practice during her entry level education.

“Well, I have to tell you that when I graduated in '87, you would not have heard of (laughs), so this is nothing that I'd learned in school.”

“But I mean it was never brought up at school- I mean I don't even think it was thought of.”

Her responses on the Jette et al¹² survey further supported this. She strongly disagreed with statements relating to having received formal training and academic preparation for evidence-based practice. R reported that much of what she does know in this area was due to her interactions with the Practice owner. R stated that ideal evidence based practice would provide the clinician with a “broader scope of things to do with kids” especially relating to treatment ideas and to suggestions for teachers and parents.

However R indicated that she lacks familiarity and confidence with databases, search skills and critical appraisal skills.

For the most part, R reported a positive attitude toward evidence-based practice. She agreed that it is necessary for physical therapy practice, and she strongly agreed that she is interested in learning more about it and increasing the use of evidence-based practice in her daily practice. However R was not as positive about the relevance of research

evidence in her daily practice and decision making, indicating disagreement with these statements on the Jette et al¹² survey.

“I don’t know that I think I should with every kid, you know, look up research to say this is what I’m doing, this is why I’m doing it and explain it say in an IEP meeting- this is why, this is why, this is why... but in the event where you do have a tough case, or in the event where you said you just feel like you’ve gotten in a rut and there’s nothing new to do with a kid. You know then I would probably, should spend some more time looking into what else, you know, and why to do things”

“I think, I think it’s important, but I don’t know, I don’t know that there aren’t other ways to come up with ideas, good ideas that work with kids”

“I mean, yeah research could show it, but I still think that the, just, hands on and doing and trial and error I think is important too.”

Application and Utilization of Evidence-based Practice: Current Status

In her own practice, R ranked herself at a one (on a scale of one to 10) with regard to being an evidence-based practitioner and indicated that she has done little with regard to using research evidence for her clinical practice.

“...I really haven’t really gotten into the habit of looking into research instead of just asking (colleagues)...”

R expressed a certain amount of guilt about this, and stated that she views “keeping up” as a real challenge. She stated that a goal would be to move up to a ranking of three or four. On the Jette et al¹² survey, R indicated that she read one article per month, and she did not provide a response to the items regarding database searches and use of research information during clinical decision making. During the interview, she indicated that she does not regularly perform either of these in her practice.

R identified a number of issues that contributed to her relatively low ranking and difficulty with improvement in this area. One issue was time, and in particular the limited time she has as a school based therapist. In this setting, she is only reimbursed by the school district for the time she spends with the child, either in direct services or during consult with other school staff. Therefore any professional development related activities can only occur during time outside of work. On the Jette et al survey¹², insufficient time was the most important barrier to evidence-based practice. She indicated that lack of research skills and lack of generalizeability of the research literature to her patient populations were important barriers as well. She also identified a lack of confidence with finding and analyzing research articles, especially when the results are unclear or conflicting. She stated that when she attempted to use research evidence in the past, the information was often not practical or applicable to her clinical practice.

“I don’t feel like I could look at different studies and say all right this is a better study, cause I just, I haven’t done enough research to know that- yeah, I’m familiar with that, but that was fifteen years ago (laughs) I mean, I don’t know, so you’ve got different studies that tell you different things, and they’re conflicting- they can be completely conflicting- so then you’re even more confused”

Although R regarded the research evidence as important, she preferred other means to come up with ideas that work with the children on her caseload and that the trial and error process she utilizes has been effective. In order to improve her clinical practice, R felt strongly that continuing education and other forms of verbal instruction and interaction would be most effective for her. She characterized herself as one who does not learn well from reading and instead prefers to hear and discuss information. In addition, due to limited time and resources, it would be preferable that any learning activities occur in at a convenient time and location, and that the content emphasize practical information that

has direct applicability to her daily practice. She also indicated a desire to know more about finding appropriate research to assist with more challenging and difficult cases.

“I think I would like to know better how to find the correct appropriate research when I felt it was necessary.”

Participant L Case Report
Demographic Information:

L has been a physical therapist and in pediatric practice for approximately 20 years. Her entry level physical therapy degree is an MPT. She works about 30-35 hours per week, almost entirely in the school setting, covering four different school districts. She has 25 children on her caseload, most of which are seen once per week with a very small percentage receiving physical therapy twice per week. L reports that she regularly (at least once per year) attends continuing education conferences. She has been a member of the APTA throughout her career. The interview occurs in an elementary school classroom, early in the morning before the school day begins.

Clinical Decisions:

L reported that these are largely centered on her role as a related service provider in the educational setting. She frequently alluded to the need to support the child’s educational goals and program. As such, one decision that L was frequently faced with was determining whether services are most appropriate in the educational setting or if the child should be referred to an outpatient or medical setting. She also makes decisions regarding the amount and type of physical therapy service that is most appropriate for a particular child. These included the development of an exercise regimen and whether that child should be “pulled out” from the daily routine or receive intervention that is

integrated into that classroom routine. L also makes decisions relating to the most safe and efficient means of mobility for a child during his or her school day. This included the type of assistive device and/or whether the child should be ambulatory or rely on a wheelchair to move about the school.

“We were trying to make a decision on whether this little guy should have, like a, like an exercise, like be pulled out and whether these exercises were gonna impact him. And, it was a situation where the stairs were really an issue for him, and he, and I really believed that if we did some concentrated exercises with him that then we would be able to increase his, his efficiency on the stairs.”

“Another issue that comes up is physical, expenditure of energy in a school setting, and what you’re doing as far as taking away from their energy to perform their academic task... and trying to balance that out for the child and determine what’s the best route to go for that.”

Influences on Clinical Decisions:

L described a wide variety of influences on her decision making process. She was often constrained by factors related to physical therapy practice an educational setting. These constraints included the amount of time available in the child’s daily schedule and the availability of curricular offerings such as adaptive physical education.

“The situation as far as whether, what is available to me as far as programming for that student. Some schools don’t even offer an adaptive PE program, um, so I have to consider where those needs are best gonna be met.”

Another important influence related to school based practice is the competence and skill level of the classroom staff as these individuals are often required to carry out the recommendations of the physical therapist. This might influence the amount of training L provides for the staff, or the amount and type of exercises and activities that can be carried out by classroom personnel versus the physical therapist.

“(Decisions are) based on many factors- experience of the people that are going to be working with that child, the experiences of the school staff, views of the school staff...”

Another important influence was the concerns identified by the parents and, in some cases, the child. L noted that sometimes parents have a strong desire to emphasize physical therapy related issues within their child’s educational program. This may then lead to a change in her approach to physical therapy goals and program for that child. The children may be resistant or even refuse to use a specific type of brace or assistive device.

“...parental- sometimes you have a really strong parental feeling on what’s more important, and you know you’ve got the team, for the most part, is academically based. But sometimes you do get a parent who is much more physically interested in what their child is doing. And even though the child may be academically sound, they put more emphasis on the physical. So, my approach personally would be toward the academics, but then I would also have to consider anything that the parent might bring to that to inlay on that.”

“...also the child sometimes, in situations in the older children. I’ve had situations where children have absolutely refused to use a scooter. They just, they just don’t want to see themselves in that situation, you know in that kind of a situation. And so they will struggle to try to make it work. And I think we have to, I have to respect that.”

Once the goals and concerns of the family have been identified, L uses a very objective approach to data collection for the physical therapy examination by carefully measuring the child on relevant impairments and functional skills. The child’s performance on these tests & measures also then serves as an important influence on her clinical decision making in setting up the intervention program. For example, L will use various timed walk tests on level and on stairs to then determine if the child is able to keep up with peers and, in an emergency, to safely exit the building. This then provides the rationale

for the choice of intervention activities and a means to measure the progress and effectiveness of the program.

Other influences on decision making included consulting with other physical therapist colleagues and reliance on her experiences with other similar children and circumstances.

“...consulting with other therapists, and trying to see you know, how is it where you’re working- what do you usually see, what have you done in this situation, how have you helped the staff, you know, to make, to understand what you’re trying to get across...”

In addition, L discussed the use of research evidence to guide and support clinical decision making. On a number of occasions, she has used the research to defend the choice of a particular intervention activity or approach for a child, either to a parent or to another team member. An example relates to the most appropriate assistive device for mobility in the school setting:

“...a lot of times... probably in the last year or two years, I have been using the evidence that’s out there, some research that’s out there, to just defend a decision, like for a parent ... to try to really tell them (that) there’s studies that show that if these children expend their energy, then they’re not gonna be able to concentrate and part of what we’re seeing may be a result of that...”

L has also experienced some frustration when both the research evidence and her clinical experience suggest one course of action, but due to the influence of other educational team members, she is unable to implement that course of action.

“So to be in that situation where you’re the, you’re the expert, and you appear to be condoning something that you really don’t honestly believe in, but you’re still kind of almost forced into doing something that’s not what you believe in, has been difficult for me.”

Knowledge, Attitudes, and Beliefs Regarding Evidence Based Practice:

L defined evidence based practice as “using research and evidence to substantiate what we’re doing.” She developed her understanding of evidence-based practice mainly through reading on her own, her membership in the APTA, and through interaction with the Practice owner.

“(The Practice owner) had actually when, when (she) went through her doctoral program, she got really fired up about it and, that, she brought that back to the, to the clinic for the rest of us to benefit from. And that really got me starting to think about it.”

On the Jette et al¹² survey, she indicated that she has not had formal training in search strategies or in critical appraisal skills. However, she indicated that she is familiar with search engines and confident with finding research, but lacks confidence in her ability to critically review professional literature.

“I don’t think it’s so much, searching the literature I don’t think is the issue for me personally. I think more interpretation of the literature is where my difficulty is. I can do it from home, you know I’m set up to get the research from home, and you know I get the journals and everything, so that’s not, it’s not the information isn’t there for me and that I can’t find it. It’s more the interpretation of it.”

L had a positive attitude towards evidence-based practice. She strongly believed in the importance of an evidence based approach for pediatric physical therapists. This was due to the critical need for the profession to be as effective as possible in providing physical therapy for children who are faced with lifelong disabilities.

“...but I think it’s very important that we try to the best of our ability to be evidence based.”

“I think it’s just as important for us as it is for any other therapist out there. I mean we need, we need to know that, or at least I feel like I need to know whether what I’m doing is impacting this child in a positive way. And if, if we’re going to be making changes, almost more so, for, you know you’ve got a child who’s got the whole rest of their life in front of them, and I certainly want to be making decisions and providing things for them to do, and also with the early intervention

concept of- this is the prime years for these children to be setting patterns of movement and, you know, to be avoiding orthopedic situations, so, I mean I think it's very critical, for us to be really looking into what we can do to make that happen in a way that we know is sound."

Her positive attitude was further evidenced by her responses on the Jette et al¹² survey.

She indicated strong agreement with most of the items that reflect attitude toward evidence based practice, including that it is necessary and useful in daily practice and that it improves the quality of patient care.

Application and Utilization of Evidence-based Practice: Current Status

Although L has increased the use of research in her daily practice recently, she viewed her progress thus far toward becoming an evidence based practitioner as minimal.

"I guess what I'm doing right now is just hit or miss as situations come up, I dig into the literature and I try. So if that's strategy, random- needs based, survival- that would kind of be what I'm doing right now, just as situations come up."

She ranked herself as a three out of 10 (with 10 being an "optimal" evidence based practitioner.) However on the Jette et al¹², L indicated that she reads between six and 10 research articles per month, completes database searches between six and 10 times per month, and uses research in the process of clinical decision making between two and five times per month, In addition, as noted above, L reported using research evidence to support clinical decisions to other members of the educational team.

"The research shows that if you do these exercises this will have an impact on how they're doing over here. So that seems to bring some tangible, you know some tangible things to it."

Although she aspires to achieving a 10/10 ranking, L reported being unable to apply evidence in a consistent way with all the children on her caseload.

“I don’t think in every case that I’m applying, you know evidence based. I just am not, so I mean every situation that I came to, I would be doing that, and, every situation, you know the real thing is the check and re-check, and make sure that it’s working.”

L attributed her inability to apply research evidence in a consistent way to a lack of skill in analyzing, interpreting, and applying research, and to a lack of time available for these activities. On the Jette et al¹² survey, L identified a poor ability to critically appraise the literature and lack of understanding of statistical analysis as the most important barriers to evidence-based practice. Insufficient time was also identified as an important barrier.

“I don’t think it’s so much, searching the literature I don’t think is the issue for me personally. I think more interpretation of the literature is where my difficulty is. I can do it from home, you know I’m set up to get the research from home, and you know I get the journals and everything, so that’s not, it’s not the information isn’t there for me and that I can’t find it. It’s more the interpretation of it.”

“I have a heart to do it, but I don’t think I have the skills to do it. I think my skills are really limited, and my knowledge is pretty limited”

“I think the biggest problem that I fight is the time component.”

L identified several strategies that may lead to an improvement in her evidence based practice skills. One is to continue to mentor students on clinical affiliations.

“I think one of the things that I’ve done that I think has really enlightened me to what is going on is having students, and really hearing them talk about, um, the way they’ve been trained and seeing them do different things and ask different questions. I think that’s an important thing.”

Interacting with the Practice owner and other practitioners who are skilled in evidence based practice may be an effective strategy. Additional continuing education courses,

along with training in reading, interpreting, and applying research would be beneficial. L also identified participation in clinical research as a potential approach to improvement in this area.

L was strongly motivated to improve in this area of her professional practice. On the Jette et al¹² survey, she indicated strong agreement with being interested in improving skills relating to evidence-based practice and increasing the use of evidence in daily practice. As such, she expressed a desire to develop a more consistent strategy that ensures that these evidence based practice activities become a priority for her and therefore occur on a regular and ongoing basis.

Research Team Meeting- Establishment of Interventions and Outcomes

At the end of the planning phase, the research team met and identified several strategies and outcomes that would be implemented during phase II of the project, the acting phase. The planning phase data was reviewed by each of the participants and served as a foundation for this process. Strategies were defined as those activities and procedures that the research team would develop and then implement over a six-month time frame to enhance their ability to use research evidence in day to day practice. Outcome measures were defined as those activities, procedures and/or assessments used to identify any changes that occurred as a result of the implementation of the strategies. See Table 18 for a summary of strategies generated at this meeting, and Table 19 for a summary of outcomes.

Table 18: Proposed Strategies to Improve Evidence-Based Practice Skills

Proposed Strategies	Description	Person Responsible
Identify and obtain appropriate resources	<ul style="list-style-type: none"> • Internet access at home (one of the participants does not have either of these currently) • Obtain online access to the databases and library system of a local physical therapy program. 	<ul style="list-style-type: none"> • Each participant • Each participant and the primary investigator
In-service workshop on evidence-based practice skills	<ul style="list-style-type: none"> • Written materials unlikely to be effective. The Practice owner has used packets of information in the past, including a packet of research articles, but there is a consensus among the participants that these are difficult to understand and utilize. • Strong preference that the participants attend a workshop focused on improving knowledge and skills relating to evidence-based practice. After some discussion, it was determined that one of the group members- the primary investigator- would provide this workshop due to his knowledge in this area, familiarity with the other participants and their needs and understanding relating to evidence based practice, and his ability to tailor the workshop to those needs. • Also the logistics of setting this up within the time frame necessary for the participants prohibited the ability to identify another qualified individual willing and able to provide this workshop. • The workshop was designed to reinforce interaction among participants so that there was an opportunity to learn from each other. 	<ul style="list-style-type: none"> • N/A • Participants and primary investigator collaborated to identify objectives and structure for the workshop; primary investigator responsible for leading the workshop • N/A • Participants and primary investigator

<p>Workshop Follow-Up:</p>	<ul style="list-style-type: none"> • There was agreement on a need for follow up activities to the workshop to reinforce the ideas that were learned and to attempt to foster a more permanent change in practice in this area. • Case discussions through the Practice website, therapists would be responsible for posting a case, and other employees would then be encouraged to read the case and comment. These would be compiled and stored somewhere on the website to be available and accessible in the future • Online “course” or interaction (perhaps an online journal club?) where the process taught during the workshop is reinforced by providing additional opportunities to practice- this would also require that someone take responsibility for developing the “cases” or journal articles to review for practice and for providing feedback to the participants on the quality of their evidence based practice skills. • Compilation of files, focused on one particular topic area, where CATs (critically appraised topics- one page summaries of research articles) can be stored and accessed by all practice employees. This will entail educating the staff on how to complete a CAT (and therefore this will be part of the workshop described in #2) and encouraging each employee to contribute to the files. The files themselves again will be stored on the website so that all employees can access. • Note that some concerns were expressed about this approach: lack of incentive for therapists to 	<ul style="list-style-type: none"> • Participants and primary investigator collaborated to identify appropriate follow up activities • Practice owner to investigate establishing website capability for this • Primary investigator would lead this activity; participants would take part and gradually assume responsibility for leading this • Practice owner to work with webmaster to establish website capability for this; as a component of the workshop, the primary investigator and the participants would collaborate to develop an appropriate template for

	contribute CATs; the files themselves would need to be monitored for outdated information; may serve as a “crutch” for some, reducing their need to do their own searches for information; also the logistics of organizing these files so that they do not become too cumbersome or unwieldy would be a challenge	the CAT files
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Table 19: Proposed Outcomes

1. Self rating (on a zero to 10 scale), that was a part of each individual semi-structured interview
2. Pre & post test on critiquing an article (Connolly et al ³⁴ questionnaire)
3. Goal attainment scaling (for at least two goals for each participant)
4. Phase III administration of the Jette et al ¹² survey
5. Phase III individual and group semi-structured interviews

Phase II (Acting Phase) & Phase III (Observing & Reflecting Phase)

The purpose of phase II, the acting phase, was to implement the “therapist centered processes” aimed at enhancing the participants’ ability to access and utilize research evidence to guide clinical decision making. Therapist centered processes were defined as mutually agreed upon intervention strategies and outcomes generated by a collaborative effort between the primary investigator and the other participants. During the final phase of the project, the observing and reflecting phase, the main objective was for the primary investigator and the participants to come together to assess both the processes and outcomes of the project. Since there was considerable overlap between the results for each of these phases, they are presented together here in a similar format to the planning

phase results. The results for each phase are integrated into the case report for the Practice and into the individual case reports for each participant.

Case Reports

Practice Case Report

Table 20 summarizes the group strategies that were implemented during the acting phase.

As noted in Table 20, several of the proposed strategies from the planning phase were not implemented due to a number of constraining factors. With regard to the Practice website updates, the Practice owner experienced several unexpected staffing changes during the acting phase, which significantly curtailed the time she had for attempting to implement these strategies. In addition, the Practice does not employ an information technology staff member and instead relies on a consultant to maintain and update the Practice website. There were several constraining factors in this consultant-Practice relationship and these also precluded the implementation of the proposed changes to the website. Therefore the case-based discussion boards and CAT file storage and access did not occur. In addition, two of the five participants were unable to attend the evidence-based practice workshop, one due to illness and the other to family obligations. Both of these individuals received the workshop written materials and an extensive phone review with the primary investigator where the workshop content was reviewed in detail. Finally, the follow up online interaction was not sustained, as noted in Table 20.

Table 20: Group Strategies to Improve Evidence-Based Practice Skills-Acting Phase Status

Proposed Strategies	Description	Person Responsible
In-service workshop on evidence-based practice skills	<ul style="list-style-type: none"> Strong preference that the participants attend a workshop focused on improving knowledge and skills relating to evidence-based 	<ul style="list-style-type: none"> Participants and primary investigator collaborated to identify objectives and structure for the workshop; primary investigator

	<p>practice. After some discussion, it was determined that one of the group members- the primary investigator- would provide this workshop due to his knowledge in this area, familiarity with the other participants and their needs and understanding relating to evidence based practice, and his ability to tailor the workshop to those needs.</p> <ul style="list-style-type: none"> • The workshop was designed to reinforce interaction among participants so that there was an opportunity to learn from each other. 	<p>responsible for leading the workshop</p> <ul style="list-style-type: none"> • <i>Status: workshop occurred; 3/5 participants attended</i> • Participants and primary investigator • <i>Status: workshop also made available to other Practice employees- three other individuals attended; see Appendix D for the workshop handout materials</i>
Workshop Follow-Up:	<ul style="list-style-type: none"> • Case discussions through the Practice website, therapists would be responsible for posting a case, and other employees would then be encouraged to read the case and comment. These would be compiled and stored somewhere on the website to be available and accessible in the future • Online interaction where the process taught during the workshop is reinforced by providing additional opportunities to practice- this would also require that 	<ul style="list-style-type: none"> • Practice owner to investigate establishing website capability for this • <i>Status: see narrative- this was not implemented</i> • Primary investigator would lead this activity; participants would take part and gradually assume responsibility for leading this • <i>Status: online interaction was</i>

	<p>someone take responsibility for developing the “cases” or journal articles to review for practice and for providing feedback to the participants on the quality of their evidence based practice skills.</p> <ul style="list-style-type: none"> • Compilation of files, focused on one particular topic area, where CATs (critically appraised topics- one page summaries of research articles) can be stored and accessed by all practice employees. This will entail educating the staff on how to complete a CAT (and therefore this will be part of the workshop described in #2) and encouraging each employee to contribute to the files. The files themselves again will be stored on the website so that all employees can access. 	<p><i>minimal and this activity was not sustained beyond the initial implementation by the primary investigator</i></p> <ul style="list-style-type: none"> • Practice owner to work with webmaster to establish website capability for this; as a component of the workshop, the primary investigator and the participants would collaborate to develop an appropriate template for the CAT files • <i>Status: workshop materials and content included instruction on development of CAT files; website was not updated- see narrative</i>
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Comments from the participants about these strategies reflected a general sense that the workshop was helpful but not sufficient to lead to changes in daily practice.

Participant P: “I thought it was a great introduction, but you know there is just too much material to get it in one, you know, setting.”

Participant R: “I agree that (the workshop) was helpful but I still feel lost out there on my own and more supervised practice is definitely needed.”

Participant K: “I thought it was very helpful, um especially for me who hasn’t had any exposure to that formally, ah formal training, in, you know 5-6 years. So that was much more helpful to me as a refresher, but then I too see that it was, you know it answered a lot of my questions, but, even still when I went to do it myself with all the notes in front of me, it just appeared, you know that I needed some more practice. And finding the time to do that is difficult. But I did find it very helpful.”

The participants offered several explanations as to the lack of sustained participation in the follow-up online interaction activity. Time constraints were the primary factor, while several of the participants alluded to the fact that the case that was reviewed during this activity did not directly pertain to a current clinical issue or question and was therefore not viewed as being helpful or a worthwhile investment of time. None of the participants expressed a willingness to take over and lead the online interaction process once the primary investigator completed the first case.

The outcomes identified for the acting phase included the GAS scores, the self-reported ranking of evidence-based practice, and any changes on the Connolly et al³⁴ questionnaire and the Jette et al¹² survey. Table 21 summarizes the GAS scores and self-reported ranking for each of the participants. Each of these outcomes will be explored in further detail in the individual case reports.

Table 21: Group GAS Scores and Self-Reported Evidence-based Practice Ranking

Participant	GAS #1	GAS #2	GAS #3	GAS #4	Ranking	
					Phase I	Phase II
Participant A	+1	-2	+2	+2	7	8
Participant K	-2	-2			2	3

Participant L	-2	-1	-1		3	4
Participant P	-1	+1			8	8.5
Participant R	0	+1			1	4.5

Table 22 summarizes the changes on the Connolly et al³⁴ questionnaire between the beginning of the acting phase and the end of this phase. The only item that was significantly different ($p < .05$), based on the Wilcoxon Signed Ranks test is item # 3, which reflects an improvement in the participants' "comfort with level of knowledge" regarding various aspects of research. In addition, on the questionnaire, items 1-3 are grouped together under the heading "knowledge and behavior." When the participants' scores on these three items are combined and compared, there is a significant difference, again indicating an improvement in these areas. None of the other items was significantly different between the beginning of the acting phase and the end of that phase. At both time periods, the participants tended to agree or strongly agree that keeping current in the research literature is a lifelong professional responsibility. In addition, most of the participants were neutral toward or disagreed with the notion that their physical therapist colleagues place a high priority on the professional research in the field of physical therapy. Table 22 also includes pre and post scores from the original Connolly et al³⁴ study. The questionnaire respondents in that study were entry level physical therapy students at baseline, and these same individuals completed the questionnaire one year post graduation.

Table 22: Participants' Connolly et al Questionnaire Pre and Post Acting Phase Item Scores

Item	Pre-Acting Phase Strategies mean/median	Post-Acting Phase Strategies mean/median	Connolly et al ³⁴ scores	
			Pre	Post
1. I now regularly read either Physical Therapy or other peer-reviewed professional journals in my area of interest.	3.00/3	2.40/2	2.85	1.75
2. I have the necessary academic background to critically review the professional literature and draw my own conclusions about the validity and utility of the findings.	2.80/3	2.40/3	3.53	2.00
3. I currently feel comfortable with my level of knowledge in research terminology, research design, and validity and reliability issues as well as in ethical	3.40/4	2.40*/3	3.70	2.00

issues in physical therapy research.				
4. The research findings published in Physical Therapy or similar professional journals are relevant to my own clinical practice and expertise.	2.20/2	2.00/2	2.93	2.59
5. Clinical practice should be based on outcome measure research and scientific studies that assess the usefulness of particular treatment regimens or protocols.	2.00/2	1.60/2	3.16	2.34
6. Clinical practice should be based on what other therapists and specialists have used as treatment protocols over the years and on what experts say works.	2.60/2	2.20/2	2.23	2.39
7. Keeping current in the research literature in physical therapy is a lifelong professional responsibility of practicing physical therapists.	1.40/1	1.40/1	2.75	2.56
8. Research in the profession of physical therapy is one of the responsibilities of the physical therapy clinician practicing in the field.	2.40/3	2.20/2	2.79	2.49
9. I personally hope to be involved in the research process in the future on a regular basis.	2.40/3	2.60/3	2.52	2.66
10. The physical therapists I have been exposed to in the field appear to place a high priority on the professional research in the field of physical therapy.	3.80/4	3.40/3	2.64	2.54
Knowledge and Behaviors Items (numbers 1-3) combined	9.20	7.20*		

* indicates significant difference ($p < .05$) between pre and post acting phase scores
Note: All items scored as follows: 1 = Strongly Agree; 2 = Agree; 3 = Neutral; 4 = Disagree; 5 = Strongly Disagree

Tables 23, 24, and 25 summarize the participant responses on the Jette et al¹² survey at the beginning and end of the acting phase. Table 23 includes items that reflect the participants' knowledge and skills relating to evidence-based practice. According to the Wilcoxon Signed Ranks Test, none of the differences in item scores between pre and post acting phase was significant. However the changes in each of the items indicated an improvement among the participants in each of these areas. Table 24 includes the items

that reflect attitudes and beliefs toward evidence-based practice. Again, none of these differences was significant, and many of the item scores remained unchanged. Table 25 reflects the evidence-based practice behaviors of the participants. Based on a visual analysis, there does not appear to be a significant difference between the beginning and end of the acting phase among these items.

Table 23: Participants' Knowledge and Skills Relating to Evidence-Based Practice: Jette et al survey pre and post acting phase mean response scores

Survey Item	Pre-Acting Phase	Post-Acting Phase
Knowledge of online databases	4.00	4.20
Formal training in search strategies	3.60	4.40
Formal training in critical appraisal	3.40	4.60
Confident in appraisal skills	3.20	4.00
Confident in search skills	3.20	4.20

Item responses: 1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree

**Table 24: Participants' Attitudes and Beliefs Regarding Evidence-Based Practice:
Jette et al survey pre and post acting phase mean response scores**

Survey Item	Pre Acting Phase	Post Acting Phase
EBP is necessary	4.60	4.60
Literature & Research Findings Useful	4.00	4.40
EBP improves quality of care	4.20	4.40
Evidence helps in decision making	3.60	3.60
Using evidence places unreasonable demands on physical therapists	2.40	2.40
EBP will lead to increased	2.40	2.40

reimbursement		
Need to increase use of evidence in daily practice	4.60	4.20
Interested in learning and improving skills related to EBP	4.60	4.20

Item responses: 1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree

Table 25: Participants' Evidence-Based Practice Behaviors and Attention to the Literature: Jette et al survey pre and post acting phase responses

Survey Item	Pre-Acting Phase	Post-Acting Phase
Read/review research literature (per month)		
1 article	3	2
2-5 articles	1	2
6-10 articles	1	1
11-15 articles		
16 articles		
Use literature for decision making (per month)		
1 time	1	1
2-5 times	4	3
6-10 times		1
11-15 times		
16 times		
Use MEDLINE or other		

databases (per month)		
1 time	2	1
2-5 times		2
6-10 times	3	3
11-15 times		
16 times		

Participant K Case Report

Approximately four and one half months into the six-month acting phase, K went on maternity leave due to the birth of her second child. Prior to her maternity leave, K described a rather “hectic” work and life schedule during which she was very pressed for time. This hindered her ability to participate in this project and implement evidence-based activities.

“This school year more so than any for some reason and I don’t know if it was because my home life was a little more hectic because my son was a little more demanding of my time when I was here and/or if it was because I had taken my work schedule from three days to two days and I was trying to fit as much as I could into those two days. For whatever reason, it was a very very hectic year this year even though I did describe it as typical.”

During the acting phase, K relied mostly on the group strategies to provide her with information and skills to aid in evidence-based practice activities. Her individual strategies focused on attempting to consistently set time aside to implement evidence-based practice activities including internet database searches. She found the workshop to be helpful, but as noted above, carrying out the evidence-based practice activities was more problematic.

“Despite coming out of the (workshop) and I felt like I was really gung ho and I was going to make that effort and I was going to sit down on the weekend or when I came home from work and I was going to get a bunch of this stuff done and I got very little done and so, I really didn’t do too much of anything.”

However during her maternity leave, K was able to find some additional time available and did successfully complete several database searches in order to obtain information to assist with clinical decision making for a child on her caseload.

“...so these days that (my older son is) gone I have so much time and I’ve been on the internet and doing searches for newer evidence a bunch since I’ve been off.”

“I’ve been able to get, you know, a couple good ideas and I’ve been able to locate some research articles that are very interesting and hopefully will be able to incorporate that into my treatment of her when I get back to see her when she is in first grade.”

“...now I can just click and go into the article now and I’ve already found it and I’ve done all that good stuff. So I have like three saved on my computer right now which to me was a huge step because I hadn’t really had the time to do any exploring before.”

Despite these recent successes, K indicated that she does not feel that she has made significant progress in her evidence-based practice activities. She described some improvement in her knowledge and skills.

“I think I always had that good intention, but at least now I feel like I have more tools that I can use. So I was probably a 2 six months ago (laughter) and now I’m a little better equipped.”

“...much better coming out on this end than I was going in. I do think I always had the desire, but I feel a little more confident now about it.”

However, with regard to her GAS goals, K indicated little progress, scoring a “-2” on both. Her GAS goals are listed in Table 26. With regard to her self-reported ranking, K indicated that she has improved from a 2/10 to a 3/10.

“I’d probably put myself at a 3 because I do have good intentions and I do have that desire to incorporate it more into my daily practice and I am hopeful that when I do return to work next school year that I will have become more familiar with it and I will be more comfortable with it and I will be able to incorporate it a little bit more. So I’m hoping to move up there on that scale a little bit...”

Table 26: Participant K Goal Attainment Scale Scores

<p>-2: Read one research article every two months*</p> <p>-1: Read one research article every month</p> <p>0: Read two research articles every month</p> <p>+1: Read three research articles every month</p> <p>+2: Read > three research articles every month</p>
<p>-2: Rarely if ever incorporating ideas from research articles*</p> <p>-1: I will incorporate a new treatment or evaluation idea from a research article into the program for one child on my caseload</p> <p>0: For two children on my caseload, I will incorporate a new treatment or evaluation idea from a research article into his/her program</p> <p>+1: For three children on my caseload, I will incorporate a new treatment or evaluation idea from a research article into his or her program</p> <p>+2: For greater than three children on my caseload, I will incorporate a new treatment or evaluation idea from a research article into his/her program</p>

* Indicates the final score at the end of the acting phase

K attributed her limited progress to a number of factors. One factor was her perception of the applicability of the research evidence to her clinical practice. The most common diagnosis on her caseload is cerebral palsy. However, K expressed some reservations with applying research evidence for children with this diagnosis because of the wide variety of clinical presentations. For the time period of the acting phase, K identified only one child on her caseload that required an increased effort on her part to gather research evidence. This was because this child had an unfamiliar diagnosis.

“And with the second goal, honestly, I really only had one child this year on my caseload that I really really felt the need to go out there and explore. You know... I mean if I were doing bare bones... you know... if there’s one person that I really need to look at how I’m going to treat them - you know I’d really like to use the evidence with this girl because I just really didn’t have the personal bank to draw from experience-wise. So for her, I have not been able to incorporate anything because I haven’t done the research - and I didn’t do the research until after I was (on maternity leave)...”

There were additional factors that influenced K's ability to implement evidence-based practice activities. On the Jette et al¹² survey, she indicated a slight increase in her confidence with searching and critical appraisal skills. However, K continued to rank insufficient time and poor ability to critically appraise the literature as important barriers. These barriers tended to overlap in that she expressed a reluctance to attempt evidence-based practice activities. This reluctance was mainly due to her expectation that her insufficient skills would lead to a significant increased time requirement to complete the activities, with a diminished likelihood that the experience will be successful.

“My inexperience with it...I think that's a big personal hang-up of mine just because it makes it that much more daunting of a task to do it. I know I've said this before, but I feel like if I was more experienced with it and I knew that it would maybe only take me ten minutes to go and look something up then it wouldn't be such a personal roadblock that I might be more willing to sit down and do it. But, you know I just wonder how long... how many searches to do you have to do... how much time does this take... you know... how many times is it going to take me - 45 minutes or an hour to find something when I just don't have that time to give.”

Inexperience and lack of confidence with evidence-based practice activities also impacted K's willingness to use research evidence to justify a clinical decision.

“I don't even, I don't feel confident enough in my skills to even be able to, to stand behind something that I find firmly because I am not 100 percent sure that I didn't exhaust all of my options to find every bit of information that's out there. So if I come across something that I feel like is a reliable piece of information, is that everything that's out there? Did I do a good job in finding everything? And you know am I going to be able to stand at this IEP meeting and say, you know this is what I found and this is unequivocally the best way to go? I don't feel that confident.”

An additional consideration was physical therapy practice in the educational setting. K is the only physical therapist in the schools where she works. As such, this limits the

availability of support and interaction with colleagues and can also be a limiting factor with regard to evidence-based practice.

“...you know what, you’re out there on your own pretty much - you know in the school setting anyway - I mean if you’re working in a clinic or something, that’s completely different, but if you’re a pediatric therapist out there, itinerant working in the schools, you’re on your own. Nobody’s there to tell you that you’re doing it right or you’re doing it wrong. Nobody is there to give you good ideas and you know you can get pretty stale pretty quickly.”

Despite these challenges, K continued to have a positive attitude toward evidence-based practice. She viewed this as necessary to remain up to date and engaging and creative with her pediatric practice. She believed that evidence-based practitioners are driven to provide superior care, and willing to put in the extra time and effort to do so. On the Jette et al¹² survey, she continued to agree or strongly agree with the most of the items that reflect attitude and beliefs about evidence-based practice. She defined evidence-based practice as “proactively keep(ing) yourself updated on all of the newest evidence that comes out.” In addition, evidence-based practice is important when unfamiliar clinical situations arise.

“...evaluating the most current evidence out there and again pick and choose from the best information out there and try to apply it to my situation.”

Finally, at the conclusion of this project, K identified a number of strategies that may be effective in improving evidence-based practice skills and behaviors for her and for pediatric school-based physical therapists in general. These are summarized in Table 27.

Table 27: Participant K Evidence-based Practice Proposed Strategies

Strategy	Explanation
Individual Strategy- improve comfort level with one database	“So I think that will be a goal of mine in the future, is to try and just get a little bit more familiar with one avenue of finding these articles and then maybe at least if I can have one way to go in and get it, it would be a lot less daunting than to have all these options out there and now be familiar with any of them.”
Individual Strategy- increase personal commitment; utilize system to keep track of clinical questions and challenges for later review	“So rather than relying on those external things to make things easier for me, I’m probably just going to have to commit myself to setting aside some time on a regular basis to, you know, maybe carry around a little note pad and if something strikes me as something I’d like to research more then, you know, just write it down and maybe once every couple of weeks have some time where I can sit in front of the computer and do that. That just takes a personal commitment.”
Suggested strategy- profession: evidence-based guidelines	“... if you were given this (evidence-based) information ... and then you could sort of you know work on just incorporating and then that might get you more used to you know - you might see some great result from something that you’re doing that’s different and that might sort of drive you.”
Suggested strategy-profession: journal club	“I think something like that would be helpful...so, you know I mean, personally I think that anything that I would be successful at would be something that would be conducted online, you know at your leisure, through emails or, a chat room, or, you know something that you

	could just do on your own time, because I am just terrible at making anything in the evenings.”
Suggested strategy-profession: mandatory continuing education requirements for licensure	<ul style="list-style-type: none"> • “I think they should be required. Really. I just... and sadly enough, again, you know, I’m- that puts me over that edge, that you know, I mean I think you can find 300 reasons why you shouldn’t do it this year- kind of a thing- and I do it myself. I mean, I do it myself... I try not to, but I do, and I just think, as a profession, it puts the value on it. I mean if we’re gonna say that we’re doing that, and then we don’t put value on it...? I guess that’s how I feel. But the sad thing is again, I don’t push myself to individually do that.” • “...or make, you know, part of the continuing education requirement be that you actually go to a course that involves a lab or whatever else. You can’t just do all home studies... you know if you can actually go and practice - have to practice what you’re learning and that type of thing and you know have to have your performance evaluated by someone who’s more schooled in that theory than you, then that might be very effective.”

Participant P Case Report

P characterized the six-month time frame of the acting phase as “fairly typical” and extremely busy. She described the educational setting as very unpredictable in terms of new referrals and transfer students. This unpredictability made it difficult to maintain a consistent schedule and to set a regular time aside for evidence-based practice activities such as reading journal articles or completing database searches. P had the added challenge and unpredictability of owning and managing the Practice, including managing the outpatient clinic, her own weekly caseload in the schools, and finding coverage for her employees when they are out on extended leave for such things as illness or maternity leave. Finally, P is the Mother of two young school-aged children, which takes up a considerable amount of her non-work time.

Despite these multiple constraints on her time, P continued to be a proponent of evidence-based practice during the acting phase. Her responses on the Jette et al¹² survey indicated strong agreement with items reflecting attitude towards evidence-based practice. In addition, she reported that she regularly reads research articles, completes database searches, and applies research findings to practice- all between six and 10 times per month. Her self-reported knowledge and behaviors on the Connolly questionnaire also continued to be at a high level. P felt strongly that all pediatric physical therapists should be evidence-based practitioners.

“I think they absolutely need to be if they are going to be respected as a profession out there.”

Her individual strategies to improve evidence-based practice during the acting phase were focused mainly on assisting her employees in improving in this area. One of her GAS goals reflected this. For example, during the planning phase, the participants identified the use of the Practice website as a potential means to share information about individual cases and about pertinent research evidence. P indicated a willingness to investigate the possibility for these website capabilities. She also indicated a willingness to continue to function as a resource for the Practice employees as clinical questions arose. Finally, she was very supportive of the workshop activity and encouraged all of her employees to attend. P attended the workshop herself and, although much of the content was a review for her, she reported that she regularly integrated this information into her practice on a consistent basis.

At the conclusion of the acting phase, P ranked herself at an 8.5/10 as an evidence-based practitioner, in comparison to an 8/10 at the beginning of this phase. She recently received a TDPT degree and attributed much of her knowledge and skills relating to evidence-based practice to the course work required to complete this degree. Also see Table 28 for a summary of her GAS goals. P was able to make some progress on her ranking and each of these goals, but not as much progress as she would have liked. She expressed some disappointment with this, but attributed the lack of progress mainly to the significant time constraints.

“...and that was somewhat frustrating for me because I’m a person who if I commit to something I like to do it 100%. I like to be able to everything that’s asked of me. And that just wasn’t feasible.”

“I could have - if I had the time - done probably more formal stuff with my staff and did a lot more - provided more - what do I want to say.... resources for them to maybe utilize EBM...”

“I mean I am always looking to improve. I think you can always improve. And I think it’s sort of like grades - you know - it’s easy to get a C, a little harder to get a B. To get that consistent A you have to put a lot more.... It’s an exponential thing - it’s not... so I think to move from 8.5 to 9 is harder than moving from 3 to 5 you know and that kind of thing.”

Table 28: Participant P Goal Attainment Scale Scores

+2	100% of the staff will utilize EBM in 100% of their caseload evaluations and plan of treatments.
+1	75% of the staff will utilize EBM in 75% of their caseload evaluations and plan of treatments.
0	50% of the staff will utilize EBM in 50% of their caseload evaluations and plan of treatments.
-1	25% of the staff will utilize EBM in 25% of their caseload evaluations and plan of treatments.*
-2	0% of the staff will utilize EBM in 0% of their caseload evaluations and plan of treatments
+2	EBM will be utilized in 100% of my evaluations and ongoing assessments (choice of diagnostic tools and prognosis) and plan of treatment choices.
+1	EBM will be utilized in 85% of my evaluations and ongoing assessments (choice of diagnostic tools and prognosis) and plan of treatment choices.*
0	EBM will be utilized in 75% of my evaluations and ongoing assessments (choice of diagnostic

tools and prognosis) and plan of treatment choices.

-1 EBM will be utilized in 60% of my evaluations and ongoing assessments (choice of diagnostic tools and prognosis) and plan of treatment choices.

-2 EBM will be utilized in 50% of my evaluations and ongoing assessments (choice of diagnostic tools and prognosis) and plan of treatment choices

* Indicates the final score at the end of the acting phase

Along with time constraints, P identified a number of other barriers and challenges to evidence-based practice. She frequently alluded to a lack of incentive or motivation for physical therapists to provide high quality care in the educational setting. One issue was the lack of reimbursement for time spent on professional development, in contrast to teachers and other school district employees who have work time set aside for these activities.

“...so for us to be in the schools to do those, even though we’re contracted - they need to look at that that’s important too. They decided that (continuing education) was important for teachers to pay subs that are like \$100 per day or more, and, it’s all during school time.”

In contrast, physical therapists working in the educational setting are frequently contract employees and as such only reimbursed for the time they spend with the child or in consultation with the classroom staff for that child. Another consideration was that there was no difference in reimbursement rates for individuals who have amassed more skills, knowledge, and expertise through ongoing professional development. These individuals receive the same reimbursement rate as their less experienced and less knowledgeable colleagues. Therefore P expressed the sentiment that the educational system does not encourage ongoing professional development for related service personnel such as physical therapists.

“So I mean, so on one hand they may verbally encourage it, but there’s not that, when they’re looking at that financial what they’re paying us they’re not considering that piece into that, you know. They’re still, they want us to come, do

it and go. So you know I think that perhaps adds to the whole complexity of the situation.”

An additional barrier for many physical therapists working in the educational system was the likelihood that they are often working part time. P described this as a significant constraint to evidence-based practice activities since this arrangement tends to foster an attitude of showing up, doing your job, and leaving.

“One of the issues I do see with pediatric therapists is the majority of them are part-time...they are off on summers. So that’s an issue too. Working full-time versus part-time your whole mindset - your whole availability...”

“A lot of times (being a) part-time therapist almost necessitates they act more like a technician because they just want to go do their stuff and leave.”

“I think it is hard to work part-time. I actually find it easier to work full-time because then my kids schedules are more set, my schedule is more set; whereas part-time allows you to be more available for things that you normally say “well, I’m sorry I can’t do that I work full-time.”

At the conclusion of this project, P identified a number of proposed strategies that may be effective in enhancing evidence-based practice for pediatric physical therapists working in the educational setting. See Table 29 for a summary of those proposed strategies.

Table 29: Participant P Evidence-based Practice Proposed Strategies

Strategies	Explanation
Individual & Practice Strategy: evidence-based practice guidelines	<ul style="list-style-type: none"> • “For example, one of the things that I would really like to do and I just haven’t found the time is that I have come up with some standard stuff that I use now. The walking speeds, the time timed up and down stairs. If I could put that into a manual for my therapists and have it for me too, where it is all right there at my fingertips, it’s like a book of standard tests and measurements or whatever, I could see then that would save people a lot of time and save me time both with my staff and for me. The key is though, where do I find the time to put that together, or can I find someone to do that.” • “So I feel at this point what (the Practice employees) need are references. They are more than happy to use - like if I provide them with a table - or provide them with the

	<p>research - and providing them even with the research article doesn't do because a lot of times they are like "Well, I don't understand this." You know - like providing them with the table. Providing them with a summary - yes. That's how I see them most effective at this point."</p> <ul style="list-style-type: none"> • "So I think creating a guideline book would be very useful, because you give them that information and they can apply it."
Individual Strategy: advocating for and utilizing access to computer and internet resources in schools	"I have made an increased effort to have access to computers and I've found that every single school does have access to the internet because the teachers are using the internet for lesson plans, so if I have a kid absent or if I'm waiting for a kid and I have 15 minutes I'll say, hey do you have a computer I can use?"
Individual and suggested professional strategy: advocating for increased recognition and reimbursement for expertise and professional development	See narrative
Individual strategy: collaborate with the teachers and administrators to increase evidence-based practice in the educational system	<ul style="list-style-type: none"> • "I talk with teachers, and I'll tell you why. I was amazed this year how many of my teachers also used evidence based." • "So actually my teachers are becoming wonderful resources."
Suggested strategy-profession: mandatory continuing education requirements for licensure	<ul style="list-style-type: none"> • "I have been an advocate of that since 1981 when I became a therapist (laughter). I could never understand why this wasn't mandatory. And one of the things they said was, "well you are a professional, you should want to do it." Well - that's unrealistic. People are only going to do what they have to do." • "It is just the way life is. It doesn't matter if you have a PhD or if you have no degree. Yes, I am a huge advocate of it. And I do think that one of the issues though is finding effective continuing ed programs, because so many of them you go and come out saying "Well I didn't learn anything.""

Participant A: Case Report

A described the six-month time frame of the acting phase as fairly typical. She reported that during that time period, she was successful at implementing her individual strategies identified during the planning phase. These included obtaining access to the internet in her home, and making more efficient use of her time at work and at home to carry out evidence-based practice activities.

“...during my down time I would say - you know even if its during my workday or if its at home - the first thing I do is that I try to get on the internet to... like at

certain websites... and get different journal articles from friends that do belong to APTA and look at their journals.”

“So like I’ve tried to use evidence-based practice to the best of my ability when I have you know prep periods or like at night and stuff to see what the most current research is.”

Another individual strategy, reflected in two of A’s GAS goals, was to assist her colleagues by encouraging these individuals to use research evidence for evaluation and intervention skills. She was instrumental in implementing a trial journal club at her workplace, where she works with a number of other occupational and physical therapists. This trial journal club was fairly successful, although several of these colleagues were quite resistant to the idea.

“Some people are saying “oh it’s a good idea” and some people are saying like “I did this in college, why am I doing this now,” so we’ll see how it goes. I know one person that says that it’s stupid and he’s not even coming to work that day.”

A consistent theme for A was that participation in this project provided an impetus to apply many of the evidence-based practice skills she learned during her entry level education. She was unable to attend the group workshop due to illness, but she did receive the written materials and participated in a follow-up discussion and review of those materials with the primary investigator. However, as noted by her pre-acting phase self-reported evidence-based practice rank (7/10), A was fairly confident with her skills and knowledge regarding evidence-based practice. Her GAS goals also reflected this, in that the focus was on increasing her evidence-based practice activities, rather than on improving her knowledge and skills about this construct.

“The handouts were helpful, but I just felt like (the workshop) was a refresher for me because I was in school like three years ago, so I didn’t get much benefit out of it because I already had learned the information.”

“I feel like it’s been positive because even before the past six months when this project started - before that I really wasn’t using the internet at all - I wasn’t looking at journal articles as much as I do now. And I feel like now that we’ve been in this process I’ve been more aware of becoming more of an evidence-based practitioner and using some of those skills to apply them to what I’ve been doing. And now that - even though the project will be ending - I think that I’ll still like be thinking that now.”

A reported that at the conclusion of the acting phase, her ranking improved to an 8/10 and that she achieved all of her GAS goals with the exception of the goal relating to finding an evaluation tool for the school setting. See Table 30 for a summary of those goals. In addition, on the Jette et al¹² survey, A reported that she performs database searches between six and 10 times per month, and she reads research articles and uses research findings for decision making between two and five times per month.

Table 30: Participant A Goal Attainment Scale Scores

-2= getting zero of my colleagues to participate more in using research articles for treatment skills
-1= getting one of my colleagues to use research articles 1 time by Nov 1 for treatment
0= (as above) use 2 research articles
+1= getting two of my colleagues to use 1 research article*
+2= getting two of my colleagues to use 2 research articles for +treatment
-2= not searching for a research article to find a new evaluation tool for school based pediatrics*

<p>-1= finding only 1 research article</p> <p>0= finding 1 research article and putting it into use</p> <p>+1= finding 2 research articles for the same evaluation tool to see which is more appropriate for school based PT use</p> <p>+2= sharing my research with 1 colleague to determine which evaluation tool would be more appropriate for our use in the school system</p>
<p>-2 = Rarely searching or using research articles for evaluation skills</p> <p>-1 = search for and obtain 1 new journal article to use for evaluation skills</p> <p>0 =search for and obtain 2 new journal articles to use for evaluation skills</p> <p>+1= search for and obtain 3 new journal articles to use for evaluation skills</p> <p>+2= Search for and obtain at 3 new journal articles to use for evaluation skills*</p>
<p>-2 = Rarely searching or using research articles for treatment skills</p> <p>-1 = Search for and obtain 1 new journal article to use for treatment skills</p> <p>0 = Search for and obtain 2 new journal articles to use for treatment skills</p> <p>+ 1= Search for and obtain 3 new journal articles to use for treatment skills</p> <p>+2 = Search for and obtain at > 3 new journal articles to use for treatment skills*</p>

* Indicates the final score at the end of the acting phase

A continued to have a positive attitude towards evidence-based practice. On the Jette et al¹² survey, she agreed or strongly agreed with all of the items pertaining to attitude toward evidence-based practice. She indicated that physical therapists that use research evidence to assist with clinical decision making are more likely to have successful outcomes with their patients.

“So that’s why I think (evidence-based practice) is very important, so that we see outcomes faster and our treatments are better and that’ s why I think that it should be important to always keep up on the research.”

“...this person would want to - I don’t want to give a specific amount of time that they spend per week, but definitely someone who is adamant about making sure that their clinical skills that they are using are the most appropriate skills and that they’re the ones that are going to be getting the most outcomes faster.”

A defined evidence-based practice as identifying clinical cases, or potential cases, and then searching for research articles from peer-reviewed journals and applying that information to the case. She reported that she was regularly able to utilize research evidence to assist with her clinical decision making. Examples included justifying a recommendation for a piece of equipment such as a stander or walker, or providing rationale for a recommendation during an IEP meeting.

On both the Jette et al¹² survey and the Connolly et al³⁴ questionnaire, she identified insufficient time as the most important barrier to evidence-based practice. Other important barriers related to ability to understand statistical analysis and critically appraise research articles. However, during the phase III interviews, A described few barriers to her evidence-based practice activities. In addition, A also expressed some frustration with colleagues who are perhaps not as knowledgeable or active with evidence-based practice and who cite insufficient time as reason for this.

“...are they evidence-based practitioners? I don't think all of them are. If you think of the amount of time that if you work in a school system that you have off in the summer - you have like 10-12 weeks off in the summer. Where is that time going that people are not working? I'm sure people are working part-time. Are they maybe working full-time jobs somewhere else, but it just It gets tiresome hearing people say , “I don't have time, I don't have time....” Well, if you don't have some time during the school year, make it up during the summer and you know take some continuing education courses and ... you know... think about things that happened during the school year that you would want to make better for the next year.”

Another potential barrier identified by A was the constraints on decision making for school-based pediatric physical therapists. For example, some families may be reluctant to implement a recommendation from the school physical therapist without first consulting with a physician or with the child's outpatient physical therapist. It therefore

becomes critical that the evidence-based recommendations are conveyed to these individuals and that the school therapist provide education and support to the family to aid them in making a decision regarding a course of treatment for their child.

Again, A identified few barriers for herself as she continues to integrate evidence-based practice activities into her daily practice. Her intention was to continue building on the practices and habits that she has established during this project. She reported being strongly motivated to continue her professional development and to therefore improve her effectiveness with the children on her caseload. At the conclusion of this project, A did identify some proposed strategies to enhance evidence-based practice for both herself and for her colleagues. These are summarized in Table 31.

“I personally think that it is fascinating and intriguing to learn new things about what’s going on and what the research was like a year or six months ago that someone has done.”

“Because after I came out of school you know I was kind of like I just want to work. You know I just kind of need to get in a new groove. And now that like I’ve been working for two years I feel like I can do more with evidence-based practice now.”

Table 31: Participant A Evidence-based Practice Proposed Strategies

Strategies	Explanation
Individual strategy: journal club	“I felt that the journal club would probably be the most helpful for me personally.”
Individual strategy: join the APTA	“I think if I belonged to APTA and I had the journals come straight to my house - I think that would be easier than you know asking people for journals and that’s one thing that I can do to change.”
Suggested strategy-profession: web based	“...but with this it would just be like the references

summaries of research pertaining to a particular area of practice	that could go along with you know - does Botox help spasticity, and like you have a whole list of articles that may support that or some articles that may not support that.”
Suggested strategy-profession: mandatory continuing education requirements for licensure	<p>“I don’t think that anyone will really change drastically or make some other people change at all unless things are mandated... and I think that’s what has to happen before we really see a shift in the profession.”</p> <p>“...and that stuff that they’re teaching you in the continuing education courses is ... going to be something that’s going to be proven and they’ve probably used research to back themselves up... that would give you more information on different skills and strategies and evaluation tools and everything just in the continuum that you could use in everyday practice.”</p>

Participant R Case Report

R reported that the six month time frame for the acting phase of this project was somewhat out of the ordinary in that she was experiencing difficulties with two schools where she was providing services. She characterized these difficulties as a difference of opinion as to what educationally therapy should include. However these difficulties appeared to be resolving as the acting phase concluded.

During the acting phase, R was able to implement several strategies aimed at enhancing her evidence-based practice knowledge and skills. She found the workshop to be helpful.

During the acting phase, R began to keep hard copies of peer-reviewed journals and journal articles in her car and with her during the work day. She indicated that this afforded her the ability to make more efficient use of down time during the day.

“I have also been keeping journals in my car earmarked with articles I want to read so I can read them when I’m waiting to see a kid. I feel much more productive doing that!”

In addition, R also continued to work part time in a pediatric rehabilitation facility. She described this facility as being very supportive of professional development, and she was able to take advantage of the opportunities available at this work place during the time period of the acting phase.

“...because there, there are in-services, continuing education opportunities. They will send anybody anywhere to any course, which is very nice and so I’ve taken advantage of that. Also, your laptop is right there...”

R indicated that over the course of the acting phase, she has made some progress in her evidence-based practice knowledge and skills. On her self-reported ranking as an evidence-based practitioner, she improved from a 1/10 to a 4.5/10 at the end of the acting phase. She attributed much of her success and improvement to her access to the opportunities at the rehabilitation hospital.

“...but I still feel like I’m doing a lot more than I used to do.”

“I think I’ve been successful - fairly successful, but I do think that most of my success is at the (pediatric rehabilitation hospital)

“...when I was preparing for you to come and I was thinking ‘well how am I doing?’ and then I thought that I feel like I’ve really made a lot of improvement, but not necessarily in the school-based arena. More so the outpatient...”

Changes in practice for R included an increased focus on evaluating the effectiveness of her examination and intervention activities. This increased attention on these areas assisted her in getting out of the “rut” of doing the same things all the time.

Although she has made some improvement, R indicated that she still had a lot of room for improvement with evidence-based practice. She expressed a preference for “short

cuts” such as utilizing dot com websites, interaction with colleagues, and reliance on information from a pediatric physical therapy text book to find evidence to guide decision making. She reported a persistent reluctance to carry out database searches for research evidence.

“I remember you saying (during the workshop) “anything that’s dot com you want to stay away from.” Pretty much that’s what I’m using. So it’s quick, it’s right there, and I’m looking it up. But I still feel like well but these aren’t the real things. This isn’t what I’m supposed to be doing.”

Table 32 summarizes R’s GAS goals. Based on her self report, she has made some improvement on each of these goals. According to the Jette et al¹² survey, R reads one article per month, and uses research findings for decision making and completes database searches two to five times per month. The improvement R reported on ranking and GAS goals was also reflected in her responses to items on the Jette et al¹² survey and the Connolly et al³⁴ questionnaire relating to knowledge, skills, and behaviors relating to evidence-based practice. For example, at the conclusion of the acting phase, she indicated strong agreement with statements reflecting confidence in ability to find and critically review professional literature. At the beginning of the acting phase, she indicated disagreement with those items.

Table 32: Participant R Goal Attainment Scale Scores

-2 Read an article on occasion
-1 Read 1 article every 2 months
0 Read 1 article per month*
+1 Read 2 articles per month
+2 Read 3 articles per month
-2 Rarely if ever utilize new information from article.
-1 Utilize new information for 1 child on my caseload
0 Utilize new information for 3 children on my caseload
+1 Utilize new information for 4 children on my caseload*
+2 Utilize new information for greater than 4 children on my caseload

At the conclusion of the acting phase, R defined evidence-based practice as:

“Using research and studies and work that other therapists have done to help influence you and improve your own treatments.”

She continued to maintain a positive attitude toward evidence-based practice throughout this project. Similar to the beginning of the acting phase, she indicated agreement with most of the items on the Jette et al¹² survey that reflect attitude toward evidence-based practice, with the exception that she was “neutral” toward the statement that evidence-based practice helps make decisions about patient care. She stated that it is important that pediatric physical therapists are evidence-based practitioners, but she also indicated that it is very challenging to do so. Part of the challenge occurs when the research is inconclusive or contradictory.

“...when I think of evidence-based I don't think of just looking at one article because you find three different articles you're going to get three different results.”

Additional challenges and barriers for R included insufficient time and general lack of comfort in evidence-based practice activities. The insufficient time along with a lack of access to computers was especially problematic in the educational setting.

“It's time limited. You don't always have time to do everything you want to do”

“...none of my schools - I don't have a computer or a laptop at all in any of them.”

“And you're kind of in and then you're out and you're running to your next school.”

“Sure there's time when you get home, but that's also home-time and you've got your own kids coming home from school and dinner to make”

“Right now - it’s not realistic unless you get a ton of cancellations and you’re sitting there and you’re actually caught up with your paperwork, then there’s a chunk of time. Right now - where I am just in my family life - I just don’t have the time in the evening”

“My lack of comfort with doing it just on my own too. Like if I knew what I was doing and I thought ‘ok I have 20 minutes to sit down and do this’ and I can do it, but I think (sigh) I have 20 minutes, but I don’t even hardly know where to begin.”

“I think you really have to make it a priority and be willing to put in the time on your own to do that, which is difficult.”

Despite these challenges, R indicated a willingness to continue to improve in her evidence-based practice knowledge, skills, and practices.

“I think I would like to ideally get into the more research-based articles as well as try to extend some of this to my school-based kids.”

At the conclusion of this project, R identified several strategies that may be effective in enhancing evidence-based practice for pediatric practitioners. These are summarized in Table 33.

Table 33: Participant A Evidence-based Practice Proposed Strategies

Strategies	Explanation
Individual strategy: working with a mentor	“I think having like a mentor to help do that the first couple times.”
Individual strategy: participating in a journal club	<ul style="list-style-type: none"> • “Probably more group get-togethers to do - you know - article reviews, and ... I think that would be the most helpful thing.” • “Therapists could read articles, get together, and discuss them.” • “...and I really think that - listening to other therapists and what they’ve seen and read is

	very helpful and sparks ideas in you... 'oh I need to look this up.'"
Suggested profession strategy: simplifying search process	"You know - somehow make it so the computer can focus in more on what you're really looking for so that ... dummies that don't know how to put in the right words can be told 'no you should be putting in this word.'"
Individual & Practice Strategy: evidence-based practice guidelines	"This is the best idea so far and I think it would be extremely helpful
Suggested profession strategy: mandatory continuing education requirements for licensure	<ul style="list-style-type: none"> • "And I think that's great" • "I do - I do think it's... I mean I never understood why every other health professional pretty much does - OT's do, nurses do, and I never really understood why PT's didn't because truly you can just kind of lag way behind." • "Actually one of the things that I'm doing right now is I'm working on getting ATP certification and then to keep that you have to have so many CE's per year."

Participant L Case Report

For L, the time period for the acting phase was fairly typical, if somewhat chaotic due to the unpredictable nature of school-based practice. L experienced a number of scheduling challenges due to snow days and school teacher strikes. However, L also indicated that she was able to cluster the children on her caseload more efficiently during this school year, and this afforded her some additional down time during the work day than what she has had in the past.

To a small degree, the scheduling challenges hindered L's ability to implement strategies directed toward improving evidence-based practice.

"...it's really hard to establish a routine of doing something when your schedules are changing all the time, so that was a little bit trying for me."

However she was able to utilize several individual strategies. L has continued to struggle with gaining access to computers and web based resources during her work day. So as a

response to this, she began to identify appropriate hard copy research journal articles and carry these articles with her during her work day. L is a member of the APTA and of the Pediatric and Orthopedic Sections of the APTA, and therefore receives monthly and quarterly journals. She therefore identified key articles within each of these journals and made sure that they are with her during the work day so that she could read them during down time, in between children or when one of the children on her caseload is absent.

“Some of the strategies I’ve used to just have more exposure, I have started, when my journals come, I open them right away and I always scan them first, and my goal in the last couple months is to at least read one article out of each one that comes. So that’s been my new thing, and, the thing about that is that I can take those in the car with me, because I still haven’t resolved the thing about access to the internet.”

“I thought okay, I’m tired about being frustrated about the computer thing, let’s just take the hard copies here, we’ll just take those, so I can always have those in the car with me.”

In addition, participation in this project and the regular interaction with the other participants increased L’s attention toward the relevance and use of evidence-based practice. She alluded to frequent use of research evidence and objective data collection to aid in clinical decision making and in providing a rationale or justification for recommendations to parents, school staff, and other IEP team members. L also stated that she is likely to attempt to gather information and research evidence when she encounters a clinical situation that is unfamiliar such as an unusual diagnosis or a proposed alternative treatment approach for one of the children on her caseload. Another situation where she is likely to seek out research evidence is when she is in a position to be teaching or instructing another professional.

“I am also recognizing- I don’t know would have ever really thought through- hey when I’m out there educating somebody else I’m more apt to do this. That’s a big difference from last year to this year. “

L indicated on her self-reported evidence-based practice ranking that she has made some improvement, going from a 3/10 at the beginning of the acting phase to a 4/10 at the conclusion.

“I think this is interesting because I think that for me personally, I’ve become more aware and realized what I’m not doing maybe (laughs) so that’s kind of an interesting thing to think about this.”

She also indicated that she has been pleasantly surprised with the number of times she has been able to attempt to gather research information.

“I, you know when I sat down and really thought about this, I have looked up a lot of different things, it just doesn’t seem like I have. I mean I was surprised when I wrote down what I could remember of what I had gotten on them, so that was kind of nice to really think about it.”

Based on her responses to the Jette et al¹² survey, L reads articles, completes database searches, and uses research information for clinical decision making two to five times per month. Her GAS goals are summarized in Table 34. L was not able to attend the workshop due to family constraints. However she did receive the written materials from the workshop and participated in an extended phone conversation with the primary investigator where the information in the written materials was reviewed in detail. Despite this, she continued to identify statistical analysis as a significant challenge for her.

“Probably the weakest link is still the statistical link- you know make sure that you’re analyzing it properly and applying it properly.”

Table 34: Participant L Goal Attainment Scale Scores

-2 = Minimal understanding of statistics and statistical analysis*

-1 = Have a basic understanding of common statistical terms

<p>0 = be able to take an article and complete statistical analysis on the article</p> <p>+1 = analyze the statistics and quality of a research article in order +to assign a "level of evidence" to that article</p> <p>+2 = Regularly (at least once per week) apply the results of a research +article to clinical practice based on analysis of the quality of that +research</p>
<p>-2 = Choose one common area of treatment in the school per academic school year and research and implement based on evidence</p> <p>-1 = Choose one common area of treatment in the school per academic school semester (half year) and research and implement based on evidence*</p> <p>0 = Choose one common area of treatment for students in the school per month and research and implement based on evidence</p> <p>+1 = Choose one common area of treatment in the school per every two +weeks and research and implement based on evidence</p> <p>+2 = Choose one common area of treatment in the school per week and +research and implement based on evidence</p>
<p>-2 = Use evidence based treatment on 0% of caseload</p> <p>-1 = Use evidence based treatment on 25% of caseload*</p> <p>0 = Use evidence based treatment on 50% of caseload.</p> <p>+1 = Use evidence based treatment on 75% of caseload</p> <p>+2 = Use evidence based treatment on 100% of caseload</p>

In addition to lack of confidence with statistical analysis and critical appraisal skills, L cited insufficient time as an important barrier to evidence-based practice.

“I guess the biggest one is the time constraint.”

“...in 25 years, I guess that’s always been kind of a, been difficult, at least in the jobs that I’ve held. I have always been in a job where there is way more to do than you’ve got time to do. And so you always have that.”

Along with limited time, the constraints on decision making inherent in the educational system also can be a barrier to evidence-based practice. Itinerant, school based therapists

lack the regular day to day contact that physical therapists working in other settings have access to.

“As an itinerant- you don’t have that like day in and day out like walking into an office where somebody’s saying ah hey... or if I think about something, I don’t always, not that I couldn’t email everybody, I just think you’re more apt to do that if you’re in a clinic and you have those couple of minutes to chat, or see somebody doing something, or just exchange a little bit of information.”

Another consideration was that frequently the school-based pediatric physical therapist functions as a consultant, assisting the classroom staff in implementing the program for a child. Therefore, the application of research evidence within a child’s intervention program is dependent on the competence and willingness of the classroom staff to implement the new or revised program. This can vary considerably within and among school districts.

“But I guess that’s an interesting thing I really never thought about in that way, but it also goes to not only am I convinced about (the evidence), but then I need to have other people (implement) it- even though I’m convinced of it.”

“...cause that’s what it basically boils down to...I am at the mercy of somebody else to help me do something. Because I am in there once a week, or maybe every other week, so I’ve got to have somebody buy in...”

A final consideration in the educational system was the lack of support for evidence-based practice activities, which must occur outside of regularly scheduled work hours.

“You know there really isn’t any time when that’s part of our job. You know that it’s considered to be on our time ourselves- its just time you have to make, and I think that makes it difficult.”

Despite these challenges, L continued to maintain a positive attitude toward evidence-based practice. Her responses on the Jette et al¹² survey indicated agreement with all of the items that reflect attitude toward evidence-based practice, similar to her responses at

the start of the acting phase. She viewed this as a critical component of her practice and uses evidence frequently to support clinical decision making.

“I think it’s tremendously important…”

“...being able to consult the literature and have some more confidence in what you’re doing because somebody else has done it before- they’ve set standards on, they’ve done research”

The evidence and standards L frequently referred to relates to systematic data collection on objective measures for the children on her caseload. She defined evidence-based practice as:

“...using set measurements to justify what you’re doing and what your intervention is, and if you’re making a difference for that child and meeting the defined goals for that individual.”

L relied on the research literature to identify the appropriate measurements and to provide normative data that allows comparison between age-matched peers and the children on her caseload.

At the conclusion of the project, L identified a number of potential strategies that may be effective in further enhancing evidence-based practice for her and for pediatric physical therapists. She is motivated to continue to improve her knowledge and skills in this area. These strategies are summarized in Table 35.

Table 35: Participant L Evidence-based Practice Proposed Strategies

Strategies	Explanation
Individual strategy: working with a student	<ul style="list-style-type: none"> • “I think having students is a really good way to be motivated” • “I just feel like that, when I had a student, that was, it just brought it more to the forefront,

	<p>um, and it was an every day thing that I was doing, so it kind of helped. So maybe doing something like that.”</p> <ul style="list-style-type: none"> • “I always have felt like the students bring, you know they bring that part out of us- that academic part out of us. But, you know from our end of it, you know I love sharing with others, and you can really bring it alive to them- bring alive what’s in the books or on a paper. And answer questions- I think it opens them up more.”
Individual strategy: educating others, including classroom staff or physical therapy students in a classroom or laboratory setting	“To have some kind of connection with doing some type of educating, um, whether that be, you know even that could even mean periodically doing an in-service in the school for the para professionals”
Individual strategy: continue to have hard copy journal articles available during work day	“I think having the strategy of having the hard copies of articles, hopefully will help”
Individual strategy: participating in a journal club and/or other group efforts directed towards evidence-based practice	“I think definitely some type of connection- with a group.”
Individual strategy: advocate for support from supervisors and school-based administrators	“I think having that acknowledgement by the people that are employers or the heads, and then putting things in place to support people in doing that is helpful.”
Suggested profession strategy: mandatory continuing education requirements for licensure	“I think they should be required.”

Project Summary

More recent literature based definitions of evidence-based practice emphasize the integration of clinical experience, patient values, and clinical circumstances along with research evidence into the best clinical decision for patients. However in this study, the participants identified the use of research evidence as synonymous with evidence-based practice and focused their efforts on improving this area of their practice. The results of this study suggest that these participants, school-based pediatric physical therapists, have a positive attitude toward evidence-based practice and believe that it is and can be an effective and important aspect of their practice. All of the participants expressed a desire to improve in their evidence-based practice skills and knowledge during phase I of this

project, although several of these individuals did not rate themselves highly on these attributes. The participants were able to identify several individual and group strategies and outcomes aimed at improving their ability to use research evidence in clinical practice. While not all of these strategies were successfully implemented, the outcomes suggested that the participants did demonstrate some improvement, although this improvement was more so related to knowledge and skills, rather than actual implementation of these skills in terms of research articles read, database searches completed, and influence on clinical decision making. Multiple factors impact on decision making and on evidence-based practice, including the constraints of the educational setting and the time available to the clinician. The participants offered several suggestions for enhancing evidence-based practice, including user friendly clinical guidelines available at the point of patient contact, and mandatory, evidence-based continuing education requirements for professional licensure.

Chapter 5 Discussion

This chapter is organized around the research questions for this project.

Research Question #1: What are the current beliefs, attitudes, and practices of a group of pediatric physical therapists toward the use of scientific research evidence to guide routine clinical decision making?

Evidence-based practice is defined as the integration of individual clinical expertise, individual patient preferences and actions, clinical state and circumstances, and the best

available external clinical evidence from systematic research in making decisions about the care of individual patients.^{3, 4, 7, 29} The focus of this project was on that aspect of evidence-based practice relating specifically to the use of systematic research in making decisions. Interestingly, the participants defined evidence-based practice as using scientific research, either proactively or reactively, to identify information that is likely to be helpful in making decisions about patient evaluation and treatment. In their definitions, none of the participants mentioned the other aspects of evidence-based practice, such as clinical expertise or patient preferences, when asked to provide a definition of this construct. This was despite attending the workshop, and/or reviewing the written materials for the workshop, where the literature-based definition was provided.

Despite this somewhat restricted definition, when asked to describe their clinical decision making, the participants frequently mentioned a number of influences that are elements of the literature-based definition of evidence-based practice. These included specific reference to past experiences and interaction with colleagues, the constraints and limitations of the educational environment, the response of the child, and the goals of the child and of the IEP team, which includes input from the family. Based on these responses, it appeared as though the participants tended to rely on these factors more so than on information from scientific research evidence to guide decision making. This finding is in concordance with previous research indicating that many physical therapist clinicians base clinical decisions on factors other than information from scientific research.^{12, 24, 25, 33-35, 167, 171} Studies published in 1997 and 1999 indicated that physical

therapists relied more heavily on initial education and training when selecting treatment techniques.^{24,25} Other prominent factors that influenced decision-making include attendance at continuing education conferences, prior experience, and peer suggestions.^{24, 25, 61, 171}

Beliefs about evidence-based practice, as operationally defined for this project, referred to the ways in which these clinicians (the participants) valued the construct of evidence-based practice and the use of scientific research evidence to guide clinical decision making as a part of their professional practice. As employees of the Practice, the participants had the benefit of a supervisor (the Practice owner) who is extremely positive about the importance of ongoing professional development, lifelong learning, and evidence-based practice. In the Practice documents, there were a number of specific references to supporting employees' career training and professional growth. In addition, throughout the entire project, the participants frequently referred to the benefits of utilizing research evidence as a rationale for clinical decisions. The use of this information was thought to increase the confidence of the participants, improve the outcomes for the children on their caseload, increase the available range of treatment options, and enhance the stature of the physical therapy profession. Responses from the participants and the other Practice employees on the Jette et al¹² survey and the Connolly et al³⁴ questionnaire also reflected positive beliefs toward evidence-based practice and were similar to the responses reported in those studies.^{12, 34}

Attitude towards evidence-based practice, as operationally defined for this project, referred to the participants' manner, disposition, or feelings towards the construct of evidence-based practice and toward the use of scientific research evidence to guide clinical decision making. Similar to previous research,^{12, 23, 34, 35, 53, 167, 172} the physical therapists in this project displayed a positive attitude toward evidence-based practice. The participants and other Practice employees agreed or strongly agreed with the items that reflected attitude toward evidence-based practice on the Jette et al¹² survey. None of these individuals selected "lack of interest" in evidence-based practice as a significant barrier and in fact all ranked this at the bottom of the nine options for barriers on the Connolly et al³⁴ questionnaire. All of the participants indicated agreement or strong agreement with the need to increase the use of evidence in daily practice and with incorporating evidence-based practice into daily practice. Finally, all indicated a willingness to try new things and incorporate updated activities into their practice and viewed the use of research evidence as an important strategy to do so.

There were relatively few reservations expressed regarding evidence-based practice, with the exception that applying research evidence may be challenging when the evidence is contradictory or unclear, or when it is unclear as to whether the research pertains to a particular child or clinical case scenario. In addition, the participants did not believe that the use of evidence-based practice would have any beneficial impact on the reimbursement they receive for their services. Finally, most of the participants disagreed with the item on the Connolly et al³⁴ questionnaire regarding their perceptions of their colleagues' views toward the use of research in the field of physical therapy. A related

theme was a lack of workplace support for evidence-based practice. So the perception was that there is minimal external support throughout the work day, either from the schools where they work, or from professional colleagues, to implement evidence-based practice.

Practices with regard to evidence-based practice were operationally defined as the activities that these clinicians carry out on a regular basis in order to utilize the construct of evidence based practice and scientific research evidence to guide clinical decision making. Although the Practice documents indicated that there are opportunities for professional growth for the employees, the inservices and formal interaction for the physical therapy staff members have been sporadic and less frequent over the past two years. All of the employees are part time, and therefore attendance at staff meetings and inservices is encouraged but not required. It was difficult to gather the five participants for this project for meetings and group interviews due to multiple scheduling conflicts and time constraints. In fact, there was only one meeting, out of the five scheduled, where all five participants were present. Although the Jette et al¹² survey responses indicated that most of the Practice employees attend at least one continuing education conference per year, during the individual interviews, three of the participants indicated that they had not done so within the previous 12 month time period. In the document review, there were records for a total of six continuing education conferences attended by staff members over the past three years.

In addition to inconsistent attendance at continuing education conferences and staff inservices, the participants and Practice employees indicated infrequent journal article

reading, database searches, and utilization of evidence in decision making. There were exceptions to this- three of the participants tended to implement these practices more frequently than their colleagues. Also the two participants who ranked themselves highly as evidence-based practitioners were more confident in their searching and appraisal skills than the rest of the Practice employees. However, similar to previous research, the majority of employees were more likely to rely on colleagues, interaction with the Practice owner, and their own experience to aid in decision making and less likely to utilize evidence-based practice activities.^{12, 23, 173, 174}

A number of barriers to evidence-based practice for physical therapists have been reported.^{12, 35, 53, 54, 61, 167, 171-173, 175} Not surprisingly, insufficient time was identified as an important barrier for the participants and the Practice employees. Other important barriers for these individuals included lack of confidence with search and appraisal skills, lack of workplace support, and difficulty with applying research to unique patient circumstances.

In summary, with regard to research question #1, the participants and their colleagues at the Practice viewed the construct of evidence based practice as the use of research evidence to assist with clinical decision making. They described multiple other influences on clinical decision making, however, and the participants tended to rely more so on these factors than on research evidence. The participants and other Practice employees believe that evidence-based practice is beneficial and necessary for optimal practice, and they have a positive attitude towards this construct. However, similar to previous research, these individuals struggled with implementing evidence-based practice

activities and pointed to a number of factors, including insufficient time, lack of workplace support, and lack of confidence with skills, as important factors that hindered their ability to do so.

Research Question #2: What is the structure for a therapist-centered process that is intended to promote and/or enhance a group of pediatric physical therapists' ability to use and integrate scientific research evidence into routine clinical decision making?

This therapist-centered process was operationally defined as mutually agreed upon strategies and outcomes centered on the practitioners' ability to access and utilize scientific research evidence to aid in clinical decision making. These strategies and outcomes were generated through a collaborative effort between the primary investigator and the participants, primarily during a meeting at the conclusion of the planning phase and after a review of the information gathered during that phase. The strategies and outcomes are summarized in Table 18, 19, and 20.

This therapist centered process was developed through Participatory Action Research, or PAR, a research approach based on the systematic study of a situation to produce new knowledge that is directly pertinent to the setting where the investigation takes place.^{72,75}

The potential benefits of involving the participants included relevant interventions and “user friendly” instruments and outcomes.⁷² The interventions, or strategies, chosen by the participants and the primary investigator included establishing individual goals relating to evidence-based practice, several individual strategies primarily aimed at increasing access to research information, and a group workshop and follow-up activity aimed at increasing skills and knowledge relating to evidence-based practice.

To date, much of the research relating to improving evidence-based practice has focused on researcher-driven, or producer push processes regarding strategies and outcomes.^{130, 144, 145, 150, 169} For example, most of the studies on knowledge transfer interventions have employed randomized controlled trial research to investigate a variety of researcher identified strategies and utilized outcomes mainly relating to decision-maker self-report.^{130, 144, 145, 150, 169} Interestingly, the evidence thus far suggests that more passive approaches to traditional continuing education are not effective in changing practitioner behavior.^{144, 145, 150, 169} The PAR approach in this project was utilized to actively engage the participants throughout the research process. Each participant contributed to the development of the strategies and outcomes. There were individual strategies and goals. An important focus of the workshop and follow-up activities was on creating opportunities for supervised practice with evidence-based practice skills. The recommendation to upgrade the website was designed to increase opportunities for interaction and collaboration among the participants and the other physical therapist employees of the Practice.

Over the course of the project it became clear that the website upgrades and the workshop follow up activity were not successful. The Practice owner expressed some regret about the website and indicated that this did not occur due to time constraints and limited resources for the Practice. She was unable to meet with the website consultant during the six month time frame of this project. The workshop follow up activity was initiated by the primary investigator, but again due to limited time constraints and to lack of

applicability of the information to their current practice, this aspect of the workshop was not sustained. Therefore the main therapist-centered processes that occurred during this project included the individual strategies and goals, the workshop, and the outcomes including the GAS scores, self reported ranking as an evidence-based practitioner, and the use of the Connolly et al³⁴ questionnaire as a before and after measure of knowledge and behaviors relating to the use of research in clinical practice. Additional outcomes relating to the overall project also included the use of the Jette et al¹² survey and the individual and focus group interview during phase III.

Research Question #3: How effective is the therapist-centered process in enhancing a group of pediatric physical therapists’ ability to utilize knowledge generated by scientific research during routine clinical decision making?

Clinical decision making relates to the thought processes associated with a clinician’s examination and management of a patient or client. It is a process in which information is appraised, viable options are identified, and a choice is made. The goal is wise action, or the best clinical judgment in a specific context.⁶⁵ Throughout this project, the participants reported multiple influences and constraints on clinical decision making that impacted on their ability to utilize research evidence. These constraints and influences, identified mainly through the phase I and phase III interviews, are summarized in Table 36.

Table 36: Constraints and Influences on Clinical Decisions in the Educational Setting

<p>Constraints on decision making & use of evidence</p> <ul style="list-style-type: none"> • Input and goals from the child and family • The school environment (amount of space; equipment; school schedule; adaptive PE availability)
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- Skills and knowledge base of the teacher(s) and classroom staff
- Cognitive, behavioral, and motor skill level of the child
- Response of the child to the intervention (trial and error); boredom and motivation factor (over the course of a long school year)
- The IEP and related service status

Influences on decision making and practice

- Other colleagues (especially those perceived to be more experienced and more “evidence-based” such as the Practice owner.)
- Continuing education conferences
- Entry level education (mainly participants A and K)
- Past experiences (mainly participants P, R, and L)
- Data collected from the child during exam and intervention
- Research evidence- for some participants, more of a reactive process when unfamiliar diagnoses or clinical presentations arise
- For participant P- TDPT
- Other professionals in the educational setting- i.e. OT, adaptive PE
- Interactions in other settings (i.e. pediatric rehab hospital-mainly participant R)

Within the context of these multiple influences and constraints, several of the participants reported an improvement in their ability to use research evidence to guide decision making. The item on the Jette et al¹² survey that reflected the use of knowledge generated by scientific research for clinical decision making indicated no change in the participants between the beginning and end of the acting phase. Most of the participants reported this as occurring between two and five times per month. However, for four of the participants, GAS goals relating to this research question were reported to have improved. For participant L, this improvement did not meet her identified goal (the zero score,) and participant K reported no progress in this area. This modest, self-reported improvement among several of the participants is in agreement with previous work indicating that multi-faceted interventions are more likely to be effective in changing health care provider behavior than more traditional passive dissemination approaches.^{130, 144-146, 150, 169}

Based on these results it is clear that clinical decision making for these individuals requires a high level of skill. Knowledge and skills relating to searching for and appraising scientific research are necessary but not sufficient for optimal clinical decision making.^{176, 177} In addition, awareness of the available research evidence available and insight as to the relevance of that research for a particular child are critical. An ability to communicate this information effectively to a number of different constituencies including the child and family, the classroom staff and other professionals in the educational setting, and perhaps the child's primary care physician and other medically oriented health care providers is also an essential element of optimal clinical decision making. Each of these factors are also important elements of expert practice in pediatric physical therapy.^{66, 67, 107, 111, 176}

Research question #4: What effect, if any, does the therapist-centered process have on the beliefs, and/or attitudes, and/or practices of a group of pediatric physical therapists toward the use of scientific research evidence in routine clinical decision making?

The focus of this question was on the construct of evidence-based practice and the ways in which the participants' attitudes, beliefs, and practices may have changed over the course of this project and as a result of the therapist-centered processes. The positive attitudes and beliefs initially exhibited during phase I were sustained.

The practices, the activities that these practitioners do and carry out on a regular basis in order to utilize the construct of evidence based practice and scientific research evidence to guide clinical decision making, showed some improvement. According to the Connolly et al³⁴ questionnaire, the participants' knowledge and behavior was significantly

improved after the implementation of the therapist-centered processes. Although none of the differences were significant, the responses on the Jette et al¹² survey indicated improvement and increased confidence with evidence-based practice knowledge, skills, and practices at the conclusion of the acting phase. The participants' self-reported rankings as evidence-based practitioners all improved as well. However with the exception of participant R, who reported an improvement of more than three points, the rest of the participants reported more nominal improvement, in the range of one half to one point. Interestingly, R reported that much of her progress occurred in her other part time job in the pediatric rehabilitation hospital. She indicated that she still struggles with evidence-based practice in the school setting. With regard to the GAS goals related to this research question, two of the participants, L & K, reported no progress on their goals. P reported slight improvement (a negative 1 score), while R reported achieving her goal (a zero score). In this category, A reported a high level of success on GAS goals, indicating a plus one or plus 2 score for three of her four self-identified goals.

Each of the participants indicated some satisfaction with their improvement in evidence-based practice as well as some frustration that more substantial progress did not occur. Improvement was attributed to several factors. Interestingly, several of the participants indicated that the workshop was helpful, but not sufficient to bring about a major change in practice. As noted above, the website updates did not occur and the follow-up online group activities were not sustained. For the most part, improvements were attributed to individual strategies that arose as a result of participation in the project and the subsequent increased attention toward and awareness of evidence-based practice issues.

For example, participant A indicated that this project provided the impetus to more consistently utilize the skills she had learned in her entry level education. Participant K indicated that the project, and in particular the workshop, provided her with some additional tools and an increased willingness to attempt evidence-based practice activities. The self-identified goals and the regular interaction with the participants and the primary investigator served as an incentive to focus on and improve in this area for all of the participants.

Along with the persistent barrier of lack of time, an important theme for the participants was a lack of incentive for evidence-based practice as a barrier. While each of the participants described this lack of incentive in different ways, it was clear that this factor had a strong influence on evidence-based practice activities and on the utilization of research evidence to guide clinical decision making. For example, participant A described a lack of evidence-based practice activities among her more experienced colleagues. The other participants also indicated that many of their colleagues were not strongly oriented towards evidence-based practice or regularly demonstrating behaviors indicative of evidence-based practice such as reading articles and completing database searches. Most of the evidence to date indicates that this observation is consistent with the behavior of many physical therapist clinicians.^{12, 23-25, 34, 35, 61, 167, 171, 173, 174} Similar to the results of the Connolly et al³⁴ study, this may have led to the impression for A that these activities were not critical to daily practice, and subsequently to her characterization of this project as a “refresher” and an impetus to apply the skills she learned in her entry level education.

There continues to be a strong push from the physical therapy profession to move towards evidence-based practice.^{5, 8-10, 12, 17, 25, 27, 85, 86} However, working in a school setting was not perceived as supportive of evidence-based practice by the participants and by the other physical therapist employees of the Practice. Lack of reimbursement for time to complete evidence-based practice activities during the daily routine of part time, school-based physical therapists was an important factor. Also, as described by participant P, lack of reimbursement for ongoing professional development and amassed expertise also contributed to this notion of lack of incentive. Lack of workplace support was also illustrated by the experiences of participant R, who reported that her improvement in evidence-based practice during this project was strongly influenced by the opportunities that arose in her other part time job in a pediatric rehabilitation hospital. In that setting, there were numerous continuing education and professional development activities for physical therapists, in contrast to the school setting, where the emphasis is on supporting teachers' professional development.

There has been little research completed to date on strategies to change physical therapists' evidence-based practice activities. As noted previously, research done in this area with other health care providers seems to indicate that changing behavior is more likely to be occur if the strategies are interactive, multi-faceted, and targeted towards different barriers to change.^{144, 150, 178} In addition, passive dissemination strategies and one-time continuing education sessions are generally ineffective.^{145, 168} This project was modestly successful at improving the participants' evidence-based practice activities

through the use of a collaborative, therapist centered process that incorporated both individual and group strategies.

Ultimately, however, the importance of these improved evidence-based practice activities is dependent upon their impact on clinical decision making. An important recommendation from all of the participants related to this is the development of evidence-based clinical guidelines that are available and accessible within their daily routine. In a recent review article, these types of guidelines, described as decision support systems, were found to significantly improve physicians' clinical practice in 68% of the research studies reviewed.¹⁴⁷ Four features were identified as independent predictors of improved clinical practice: automatic provision of decision support as part of clinician workflow, provision of recommendations rather than just assessments, provision of decision support at the time and location of decision making, and computer based decision support.

An additional consistent recommendation from all of the participants was a requirement of mandatory continuing education credits for licensure. Currently requirements for continuing education for physical therapists vary widely, and include a majority of states that have no mandatory requirements.¹⁷⁹ The participants in this project felt strongly that this requirement was necessary to ensure that all physical therapists were actively participating in ongoing professional development. In addition, several referred to the importance that the continuing education conferences were interactive, clinically relevant, and evidence-based.

Limitations

The nature of this participatory action research project does not permit generalization to a larger population. Instead, the focus was on describing in detail the phenomenon of evidence-based practice, the therapist-centered process aimed at improving evidence-based practice skills, and the impact of that process, for a group of pediatric physical therapists. No effort was made to control for extraneous factors that may have impacted on the participants' evidence-based attitudes, beliefs, and practices during the course of this project. The data analysis and interpretation processes and the measures aimed at enhancing the trustworthiness of those processes were described in depth in order to provide the reader with a thorough description of the methods for this project. The case study approach organized the data by specific cases to allow for in depth study and comparison. It is left to the reader to determine if these processes and case studies have relevance to his or her individual circumstances.

An additional limitation is that in a traditional PAR project, the participants and investigators collaborate to identify issues or concerns. In this project, the primary investigator approached the Practice owner with the issue of evidence-based practice already established. As such, the participants may not have identified this issue as one of primary concern at the outset of the project. Therefore it may be argued that the outcomes of this study may have been different if they had initially identified this as an issue and approached the primary investigator to address this.

Finally, the six-month time frame may have been inadequate to permit substantial behavior change. Most of the work in this area has measured outcomes at between three and six months. However, perhaps a longer time period for the individual and group strategies may have led to more substantial changes in the outcomes for this project.

Future Directions

There are a number of important directions for future research in this area. Similar investigations of physical therapists from different areas of practice and with a variety of work settings would be valuable. The use of outcomes aimed at the effect of evidence-based practice on clinical decision making, and more importantly, on patient outcomes, would also be of some benefit. The development and use of decision support systems holds great promise, especially in relation to the use of technology as an aspect of routine clinical practice. Finally, the development and assessment of continuing education as an aspect of ongoing professional development is an area of great need for the physical therapy profession.

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Appendices

Appendix A: Jette et al Questionnaire

This section of the questionnaire inquires about personal attitudes toward, use of, and perceived benefits and limitations of EBP.

For the following items, place a mark v in the appropriate box that indicates your response.

1. Application of EBP is necessary in the practice of physical therapy.
 Strongly disagree Disagree Neutral Agree Strongly Agree
2. Literature and research findings are useful in my day-to-day practice.
 Strongly disagree Disagree Neutral Agree Strongly Agree
3. I need to increase the use of evidence in my daily practice.
 Strongly Disagree Disagree Neutral Agree Strongly Agree
4. The adoption of EBP places an unreasonable demand on physical therapists.
 Strongly Disagree Disagree Neutral Agree Strongly Agree

5. I am interested in learning or improving the skills necessary to incorporate EBP into my practice.
 Strongly Disagree Disagree Neutral Agree Strongly Agree
6. EBP improves the quality of patient care.
 Strongly Disagree Disagree Neutral Agree Strongly Agree
7. EBP does not take into account the limitations of my clinical practice setting.
 Strongly Disagree Disagree Neutral Agree Strongly Agree
8. My reimbursement rate will increase if I incorporate EBP into my practice.
 Strongly Disagree Disagree Neutral Agree Strongly Agree
9. Strong evidence is lacking to support most of the interventions I use with my patients.
 Strongly Disagree Disagree Neutral Agree Strongly Agree
10. EBP helps me make decisions about patient care.
 Strongly Disagree Disagree Neutral Agree Strongly Agree
11. EBP does not take into account patient preferences.
 Strongly Disagree Disagree Neutral Agree Strongly Agree

For the following items, place a mark v in the appropriate box that indicates your response for a typical month.

12. Read/review research/literature related to my clinical practice.
 1 article 2–5 articles 6–10 articles 11–15 articles 16 articles
13. Use professional literature and research findings in the process of clinical decision making.
 1 time 2–5 times 6–10 times 11–15 times 16 times
14. Use MEDLINE or other databases to search for practice-relevant literature/research.
 1 time 2–5 times 6–10 times 11–15 times 16 times

The following section inquires about availability of resources to access information and personal skills in using those resources.

For the following items, place a mark (X) in the appropriate box that indicates your response. In items referring to your "facility," consider the practice setting in which you do the majority of your clinical care.

15. I have access to current research through professional journals in their paper form.
 Yes No
16. I have the ability to access relevant databases and the Internet at my facility.
 Yes No Do Not Know
17. I have the ability to access relevant databases and the Internet at home or locations other than my facility.
 Yes No Do Not Know
18. My facility supports the use of current research in practice.
 Strongly Disagree Disagree Neutral Agree Strongly Agree
19. I learned the foundations for EBP as part of my academic preparation.
 Strongly Disagree Disagree Neutral Agree Strongly Agree
20. I have received formal training in search strategies for finding research relevant to my practice.
 Strongly Disagree Disagree Neutral Agree Strongly Agree
21. I am familiar with the medical search engines (eg, MEDLINE, CINAHL).
 Strongly Disagree Disagree Neutral Agree Strongly Agree
22. I received formal training in critical appraisal of research literature as part of my academic preparation.
 Strongly Disagree Disagree Neutral Agree Strongly Agree
23. I am confident in my ability to critically review professional literature.
 Strongly Disagree Disagree Neutral Agree Strongly Agree
24. I am confident in my ability to find relevant research to answer my clinical questions.
 Strongly Disagree Disagree Neutral Agree Strongly Agree

For the following item, place a mark (X) in one box in the row for each term.

25. My understanding of the following terms is:

Term	Understand Completely	Understand Somewhat	Do Not Understand
a) Relative risk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Absolute risk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Systematic review	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) Odds ratio	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Meta-analysis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f) Confidence interval	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g) Heterogeneity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h) Publication bias	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

For the following items, rank your top 3 choices by placing numbers in the appropriate boxes (1=most important).

26. Rank your 3 greatest barriers to the use of EBP in your clinical practice.
- Insufficient time
 - Lack of information resources
 - Lack of research skills
 - Poor ability to critically appraise the literature
 - Lack of generalizability of the literature findings to my patient population
 - Inability to apply research findings to individual patients with unique characteristics
 - Lack of understanding of statistical analysis
 - Lack of collective support among my colleagues in my facility
 - Lack of interest

The following section inquires about personal demographic information.

For the following items, place a mark (X) in the appropriate box next that indicates your response.

27. What is your sex?
- Male Female
28. What is your age group?
- 20–29 y 30–39 y 40–49 y 50+ y
29. Do you currently hold a valid physical therapy license?
- Yes No
30. For how many years have you been licensed?
- <5 y 5–10 y 11–15 y >15 y
31. What is your entry-level degree for physical therapy?
- Certificate
 - Baccalaureate
 - Entry-level master's
 - Entry-level doctorate
 - Other
32. What is your highest degree attained?
- Baccalaureate
 - Entry-level master's
 - Advanced master's
 - Entry-level doctorate
 - Advanced doctorate
 - Other
33. If you do not currently hold an advanced degree, do you intend to pursue one in the future?
- Yes No Do Not Know
34. Are you a clinical certified specialist? If so, in which speciality?
- Yes No Speciality: _____
35. Do you regularly (≥once per year) participate in continuing education courses?
- Yes No
36. Do you belong to one or more professional practice-oriented organizations (eg, APTA)?
- Yes No
37. Are you a clinical instructor for physical therapist students/interns/residents?
- Yes No
38. On average, how many hours per week do you work?
- <20 20–30 31–40 >40

39. On average, how many patients do you see daily?
 <5 5–10 11–15 >15
40. How many full-time physical therapists are in the facility in which you do the majority of your patient care?
 <5 5–10 11–15 >15
41. Please indicate the percentage of your total work time that you spend in each type of activity during an average month.
- a) Patient care %
b) Research %
c) Teaching %
42. Which of the following *best* describes the location of the facility in which you perform the majority of your patient care?
 Rural
 Urban
 Suburban
43. Which of the following *best* describes the facility at which you do most of your patient care?
 Acute care hospital
 Acute rehabilitation
 Subacute rehabilitation
 Skilled nursing facility
 Privately owned outpatient clinic
 Facility-based outpatient clinic
 Home care
 School system
 University
 Other
44. Which of the following *best* describes the majority of patients and types of problems you see? Mark one box in each section.
- Orthopedic
 Neurological
 Cardiovascular/pulmonary
 Other
 Do not treat patients
- Pediatric (<18 y)
 Adult (19–64 y)
 Geriatric (65+ y)
 Other
 Do not treat patients

Appendix B: Phase I Individual Interview

Introduction

Thank you for your willingness to participate in this process. As you may remember, I am a doctoral student in Rehabilitation Sciences at Duquesne University. My dissertation research is concerned with how physical therapists use research evidence in their daily practice. More specifically, I'm interested in working with you and your colleagues here at _____ to see if together, we can develop a program that meets your needs and interests for using research evidence in daily practice. After we develop and implement the program, we'll evaluate its outcomes.

The purpose of this interview is to begin our discussion of the topic of Evidence Based Practice. I'm interested in your understanding of this topic, and learning about how you make clinical decisions in daily practice. This interview should take 45-60 minutes to complete. I'd like to tape record the interview so that later, I can transcribe it accurately and use this information, along with several other interviews to build an initial picture of

evidence based practice at _____. You will not be identified in any way. I will not use your name in any of the transcriptions or write ups of this interview. I will only use initials, or a participant identification number or a pseudonym. I will offer you a copy of the transcription for your review so that you can correct any inaccuracies. I'll also offer you a copy of any summaries and/or reports that result from this interview so that you can review my initial impressions. Do you have any questions before we begin?

Questions

The first part of this interview is directed towards the topic of making clinical decisions. Physical therapists make numerous clinical decisions every day. Tell me about some of the many clinical decisions you must make during a typical day.

During your daily routine, what factors influence how you make these various clinical decisions? What sorts of information do you consider?

How do you decide which factors are more important and which factors are less important?

Take a minute to think back to a child you worked with recently who presented as a difficult challenge. Tell me about that situation and how you went about responding to the challenges.

On the other hand, it seems that there are some fairly common injuries/disabilities that physical therapists work with. How do you keep yourself from being complacent? How do you make sure you're providing the most up to date interventions?

In general, how "eager/willing" or "not eager/willing" are you to try new things in physical therapy treatment?

Just to get a sense of how you work, tell me about a clinical situation where you tried something new.

What led you to make this decision? Was it successful? How did you evaluate the effectiveness of this "new" aspect of your treatment?

Next, I'd like talk with you about the concept of "evidence-based practice". This seems to be a topic that is discussed a lot in physical therapy these days.

First, how would you define the concept "evidence based practice"? How have you come to learn about this topic?

How would you know an Evidence Based Practitioner if you saw one? For example, what sorts of things might they do? What sorts of attitudes and/or behaviors might you see in this person?

How important, if at all, is it for pediatric physical therapists to be “Evidence Based Practitioners”? Why do you think this is so?

If you could place yourself on a continuum of Evidence Based Practice, with 1 being completely not being an evidence based practitioner and 10 being a complete evidence based practitioner, where would you put yourself today?

In what ways, if any, would you like to “move” on the continuum?

During the past year, what strategies, if any have you used to enhance your use of evidence in daily practice? How successful or unsuccessful have these attempts been? What has contributed to their success or lack of success?

I’ve asked you several questions. Do you have any questions you’d like to ask me?

Are there any questions that I didn’t ask that you think I should have asked?

Thanks.

Appendix C: Phase I Focus Group Interview

Introduction

Thank you again for your willingness to participate in this process. I appreciate your taking time to meet with me again. As you may remember from our individual interview session, I am a doctoral student in Rehabilitation Sciences at Duquesne University. My dissertation research is concerned with how physical therapists use research evidence in their daily practice. More specifically, I’m interested in working with you to see if together, we can develop a program that meets your needs and interests for using research evidence in daily practice. After we develop and implement the program, we’ll evaluate its outcomes.

I’ve talked with you all individually. From those interviews, I got a good beginning sense of where you’re at individually with evidence based practice. The purpose of this group

interview is to delve into this topic further, this time with the advantage of having several different people's opinions at the same time.

This interview should also take 45-60 minutes to complete. Again, I'd like to tape record the interview so that later, I can transcribe it accurately and use this information, along with a variety of other information to build an initial picture of evidence based practice here at _____. You will not be identified in any way. And, there are no "right" or "wrong" answers to any of the questions. I will not use your names in any of the transcriptions or write ups of this interview. I will only use initials, or a participant identification number or a pseudonym. I will offer you each a copy of the transcription for your review so that you can correct any inaccuracies. I'll also offer you a copy of any summaries and/or reports that result from this interview so that you can review my initial impressions. Do you have any questions before we begin?

Questions

First, you've each shared your thoughts or "definition" of evidence based practice with me individually. It might be interesting and helpful for you to first talk with each other about your definition.

What did you notice about each other's explanations?

You've all also told with me about where you're at individually with respect to being an evidence based practitioner. How about your clinic (the private practice) as a whole? How "evidence based" or "not evidence based" is your clinic?

What factors do you think contribute to this?

What conversations, if any, have you had about the topic of evidence based practice?

How, if at all, have you tried to apply this concept here in your clinic? (e.g. formal educational activities relating specifically to evidence based practice, journal club, in-service)

Suppose the physical therapists were to (all together) implement some new change in clinical practice. How would that occur here? How easy or difficult would that be? Why?

In what ways, if any, does your institution support evidence based practice?

What resources are in place to support this evidence based practice?

What additional resources would you like to have to enhance your ability to use research evidence in daily practice?

Appendix D: Workshop Handout

**August 26, 2006
Evidence Based Practice
Continuing Education Workshop**

Objectives:

After participating in this workshop (including follow up activities), the attendee will be able to:

1. Define evidence-based practice
2. Discuss the relevance of “evidence” and evidence-based practice to pediatric physical therapy practice
3. Distinguish between a background question and a foreground question
4. Write a clinical question based on PICO format (Patient/Intervention/Comparison/Outcome)
5. Identify and access appropriate resources for obtaining research evidence relating to physical therapy practice
6. Utilize APTA and/or internet resources to develop an evidence-base answer to a clinical question
7. Understand basic research and statistics terminology
8. Utilize understanding of research and statistics to analyze strength of the evidence
 - a. Diagnosis, prognosis, and intervention evidence
 - b. Sackett levels of evidence and grades of recommendation
 - c. AACPDM ranking system
9. Formulate the answer to the clinical question into a CAT document or Matrix spreadsheet
- 10. Apply the results of clinical research to physical therapy practice**

DEFINITIONS

Evidence based practice definition

- a. The conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients: integrating individual *clinical expertise, patient values, and clinical circumstances* with the *best available external clinical evidence from systematic research.*
- b. Integrating the research evidence into clinical decision making
- c. Other sources of knowledge (evidence)
 - i. Tradition: the way it’s always been done; stifles search for new information
 - ii. Authority: experts state something is true and we accept it
 - iii. Trial and error: haphazard and unsystematic; continuous stream of trials-therefore no basis to sort out why they are not working; very time consuming and limited in scope; stop trying when you find a “satisfactory” solution, when a better or optimal solution may still be available
- d. *It’s all **evidence**- key is deciding amount of weight to attach to that evidence- how much is it influenced by **BIAS**

CLINICAL QUESTIONS

- Cognitive dissonance versus resonance
- “Background questions”

- “Foreground questions”
 - PICO: Patient-Intervention-Comparison-Outcome

SEARCHING & ACCESSING

Resources

- e. Where to search-available resources-Lab
 - i. Textbooks
 - ii. Internet based resources- typically (but not always!) do not lead to access to full text article. Suggestions to obtain full text articles- proceed to Chatham website; local library; Paula; Joe (email)
 1. Be cautious with “.com” websites; when searching through Google or other mainstream search engines, look for information from .edu or .gov –mainly for **background** information.
 2. Medline: www.pubmed.gov.
 3. Pedro: <http://www.pedro.fhs.usyd.edu.au/index.html>.
 - a. Note: RCT’s and Systematic Reviews only
 4. Google Scholar: <http://scholar.google.com/>.
 5. Chatham College Library Database system: www.chatham.edu. Then library link, then databases- need to have username and password (from Lynn- username: lharsh, password: PRI116)
 - iii. APTA member resources
 1. Web portal- “Open Door” (Proquest and CINAHL databases): www.apta.org. then research link
 2. Hooked on evidence www.apta.org. then research link
 3. Physical Therapy Journal (online and hard copy) www.apta.org. then publications link
 4. Pediatric Physical Therapy (online and hard copy) www.pediatricapta.org then resources link

ANALYSIS OF THE EVIDENCE

Background Information-Highlighted

Fundamentals of Research

- a. **Definition of Research:** an investigative process that is used to gain knowledge about the world; cause and effect, properties and characteristics of nature; requires one to be open minded and skeptical (<http://www.csicop.org/> --committee for the scientific investigation of claims of the paranormal)

- b. “Proved” versus “disproved”: instead, “suggest” “strongly suggest” “support”

Categories/Classification Schemes-Research

Basic versus Applied

Basic/Bench	Clinical/Applied
<ul style="list-style-type: none"> obtain empirical data that can be used to develop, refine, or test theory; acquisition of new knowledge for it’s own sake 	<ul style="list-style-type: none"> Structured & systematic process of investigating facts and theories and exploring connections examine clinical conditions and outcomes establish relationships between clinical phenomena generate evidence for decision making provide the impetus for improving methods of practice Empirical AND critical: results must be observable, documented, and examined for their validity Performed in many different settings; variety of tools; Focused on the application of clinical theory and interventions Generating new or different ways of viewing clinical problems Element of art/ creativity

Continuum

Descriptive	Exploratory	Experimental
Non experimental; describe/document characteristics of a group; case study, developmental, normative, qualitative, evaluation, surveys/questionnaires	Non experimental; examine phenomenon of interest and explores its dimensions; correlations...predictions, epidemiology, methodological (reliability & validity), historical	compare two or more conditions; control &/or account for extraneous variables; RCT, SSR, quasi-experimental, meta-analysis

Quantitative versus Qualitative

Quantitative	Qualitative
All across the continuum Measuring Outcomes Standardized Conditions Numerical data, statistics, scales	Subjective, narrative information Less structured conditions Open ended questions, interviews & observations Purpose(s): describe state/conditions; explore associations, formulate theory and/or generate hypotheses

Sackett

Diagnosis & Screening	Prognosis	Therapy
<ul style="list-style-type: none"> • Is the evidence about the accuracy of a diagnostic test valid? • Does this (valid) evidence demonstrate an important ability of this test to accurately distinguish patients who do and do not have a disorder? • Can I apply this diagnostic test to a specific patient? • See “advanced stats” handout 	<ul style="list-style-type: none"> • Which outcomes could happen? • How likely is it that these outcomes will happen? • Over what time period? • See “advanced stats” handout 	<ul style="list-style-type: none"> • Intervention • Efficacy • Effectiveness • Experimental Designs, especially RCT’s and systematic reviews of RCT’s • See “Stats Matching Quizzes”

Research Terms & Definitions

Case-series is a report on a series of patients with an outcome of interest. No control group is involved.

Cohort Study involves identification of two groups (cohorts) of patients, one which did receive the exposure of interest, and one which did not, and following these cohorts forward for the outcome of interest.

Cost-Benefit Analysis converts effects into the same monetary terms as the costs and compares them.

Crossover Study Design: the administration of two or more experimental therapies one after the other in a specified or random order to the same group of patients.

Cross-Sectional Study the observation of a defined population at a single point in time or time interval. Exposure and outcome are determined simultaneously. See also glossary of study designs. Decision Analysis is the application of explicit, quantitative methods to analyse decisions under conditions of uncertainty.

Ecological Survey: based on aggregated data for some population as it exists at some point or points in time; to investigate the relationship of an exposure to a known or presumed risk factor for a specified outcome.

N-of-1 Trials The patient undergoes pairs of treatment periods organised so that one period involves the use of the experimental treatment and one period involves the use of an alternate or placebo therapy. The patients and physician are blinded, if possible, and outcomes are monitored. Treatment periods are replicated until the clinician and patient are convinced that the treatments are definitely different or definitely not different.

Overview is a systematic review and summary of the medical literature.

Randomised Controlled Clinical Trial a group of patients is randomised into an experimental group and a control group. These groups are followed up for the variables / outcomes of interest. See also glossary of study designs.

Significance comes in 2 varieties: *statistical* significance is when the p-value is small enough to reject the null hypothesis of no effect; where *clinical* significance is when the effect size is large enough to be potentially considered worthwhile by patients.

Systematic Review is a literature review focused on a single question which tries to identify, appraise, select and synthesis all high quality research evidence relevant to that question. **Correlation:** with a strong correlation, we can infer something about variable A by knowing variable B; correlation coefficient from 0 to 1.0; NOT causation- have to include a number of other factors- i.e. time, physiology, dose-response, multiple studies- in order to infer causation

Regression-exploring relationships and making predictions- predicting quantifiable clinical outcomes; examination of two variables, X and Y, that are linearly related or correlated; the variable X is the independent or predictor variable, and the variable Y is the dependent or criterion variable

Resource: <http://www.cebm.net/glossary.asp>
<http://healthlinks.washington.edu/ebp>.

Statistics Terms & Definitions

- I. **P value and probability:** the probability of getting the results you obtained if the null hypothesis (a statement of no difference or no relationship between the variables) is true
- II. **Type I error:** An incorrect decision to reject the null hypothesis; concluding that a relationship exists between the variables when in fact it does not
- III. **Type II error:** An incorrect decision to accept the null hypothesis; concluding that no relationship between the variables exists when in fact it does
- IV. **Confidence Intervals:** The range of values within which a population parameter is estimated to fall, with a specific level of confidence
- V. **Parametric Statistics:** interval/ratio data, assumptions about the distribution of variables
- VI. **Non-parametric statistics:** nominal/ordinal data; NOT based on any assumptions about the distribution of variables
- VII. **Independent variable:** the variable that is presumed to cause or determine a dependent variable; manipulated by the researcher
- VIII. **Dependent variable:** the outcome- assumed to depend on or be caused by the independent variable
- IX. **Data type/ Level of Measurement**
 - a. **Nominal:** mutually exclusive and exhaustive categories with no rank order (gender, nationality, blood type, diagnosis)
 - b. **Ordinal:** scores are ranks (MMT, min/mod/max assist, survey scales)
 - c. **Interval:** values have equal intervals, but no true zero point (calendar years, measures of temperature)

- d. **Ratio:** values have equal intervals and a true zero point (ROM, height, weight, force)
- X. **Groups**
 - a. **Independent:** two or more separate treatment conditions or groups of people- not associated in any way
 - b. **Dependent:** situations where the levels of the independent variable are correlated in one or more ways; can be the same people tested two or more times (eg repeated measures design); or when groups are matched on some relevant characteristic and then assigned to each group; or identical twins as “matched pairs.”
- XI. **Numbers:** how many levels of the independent variable(s), and how many dependent variables are measured
- XII. **Chi Square (Fisher’s exact)** - nominal frequency data; non-parametric; comparing observed frequencies within categories to frequencies expected by chance
- XIII. **T test:** parametric; comparing two means
- XIV. **ANOVA:** parametric; comparison of three or more treatment groups or conditions, or the simultaneous manipulation of two or more independent variables
- XV. **Number Needed to Treat:** number of patients that need to be treated to prevent one bad outcome
- XVI. **Correlation:** the tendency for variation in one variable to be associated with variation in a second variable
- XVII. **Regression analysis:** examining the predictive relationship between a dependent (criterion) variable and an independent (predictor) variable
- XVIII. **ANCOVA:** comparison of two or more treatment groups while controlling for the effect of one or more extraneous variables (called covariates)

References for statistics information:

Sackett et al. **Evidence Based Medicine: How to Practice and Teach EBM. 2nd Edition;** Churchill Livingstone. 2000.
 Portney & Watkins. **Foundations of Clinical Research: Applications to Practice. 2nd Edition;** Prentice Hall. 2000

Statistics: Diagnosis & Prognosis

Sensitivity

Proportion of people with the target disorder who have a positive test result. It is used to assist in assessing and selecting a diagnostic test/sign/symptom.

SnNout

When a sign/test/symptom has a high Sensitivity, a Negative result can help rule out the diagnosis.

Specificity

Proportion of people without the target disorder who have a negative test. It is used to assist in assessing and selecting a diagnostic test/sign/symptom.

SpPin

When a sign/test/symptom has a high Specificity, a Positive result rules in the diagnosis.

Likelihood Ratios

The Likelihood Ratio (LR) is the likelihood that a given test result would be expected in a patient with the target disorder compared to the likelihood that that same result would be expected in a patient without the target disorder.

How to Calculate LRs

We can assume that there are four possible groups of patients, as indicated (a,b,c,d) in the table below:

		TARGET DISORDER		
DIAGNOSTIC TEST RESULT	+	a	b	a + b
	-	c	d	c + d
		a + c	b + d	a + b + c + d

From these we can determine the sensitivity and specificity as follows:

SENSITIVITY = $a/(a+c)$

SPECIFICITY = $d/(b+d)$

We can now use these to calculate the likelihood ratio for a positive test result (LR+):

LR+ = $sensitivity/(1-specificity)$

Similarly, we can calculate the likelihood ratio for a negative test result (LR-):

LR- = $(1-sensitivity)/specificity$

High likelihood ratios (e.g., LR>10) indicate that the test, sign or symptom can be used to rule in the disease, while low likelihood ratios (e.g., LR<0.1) can rule out the disease. Likelihood ratios of around 1 indicate that no useful information for ruling the diagnosis in or out has been produced from the clinical findings.

Odds ratio (OR)

The ratio of the odds of having the target disorder in the experimental group relative to the odds in favor of having the target disorder in the control group (in cohort studies or systematic reviews) or the odds in favor of being exposed in subjects with the target disorder divided by the odds in favor of being exposed in control subjects (without the target disorder).

Relative Risk (RR)

Estimate of the magnitude of the association between an exposure and disease, indicating the likelihood that the exposed group will develop the disease relative to those who are not exposed.

NOTE: Both OR and RR are used to calculate NNT (and NNH), which is the more clinically relevant statistic. If either the OR or RR numbers are very close to 1.0, then the positive (or adverse) outcome is no more likely to occur than without exposure to the causative agent.

Critical Appraisal/Analysis of Evidence

- a. **Bias** -an effect or interference at any stage of an investigation tending to produce results that depart systematically from the true value; prejudice, preconception, favoritism, preconceived notion
- b. **Levels of Evidence according to Sackett et al** - <http://www.cebm.utoronto.ca/>

Level of Evidence	Research Design
1a	Systematic review with homogeneity of RCTs
1b	Individual RCT with narrow confidence interval
2a	Systematic review (with homogeneity) of cohort studies

2b	Individual cohort study (including low quality RCT)
3a	Systematic review (with homogeneity) of case control studies
3b	Individual case control study
4	Case series and poor quality cohort and case-control studies
5	Expert opinion without explicit critical appraisal, or based on physiology, bench research, or “first principles”

American Academy of Cerebral Palsy & Developmental Medicine (AACPDMD)
Levels of Evidence for *Single Subject Designs*

Level of Evidence	Research Design
I	N of 1 randomized controlled design
II	ABABA design; alternating treatments; multiple baseline across subjects
III	ABA design
IV	AB design

AACPDMD
Quality Assessment Scale

Study	Level/Quality	1	2	3	4	5	6	7

Conduct of the study is judged as Strong (‘yes’ score of 6 or 7), Moderate (score 5 or 4), or Weak (score ≤ 3)

Legend: 1. Were inclusion and exclusion criteria of the study population well described and followed? 2. Was the intervention well described and was there adherence to the intervention assignment? (for 2-group designs, was the control exposure also well described?) 3. Were the measures used clearly described, valid and reliable for measuring the outcomes of interest? 4. Was the outcome assessor unaware of the intervention status of the participants (i.e. was there blind assessment)? 5. Did the authors conduct and report appropriate statistical evaluation including power calculations? 6. Were dropout/loss to follow-up reported and less than 20%? For 2-group designs, was dropout balanced? 7. Considering the potential within the study design, were appropriate methods for controlling confounding variables and limiting potential biases used?

Clinical Decision Making

- Cognitive resonance versus dissonance
- Making clinical decisions in the face of uncertainty and variability is part of the “art” of clinical practice.
- Developing a reasoned and substantiated argument for your practice
- Outcomes: impairment, functional limitation, disability- measurable, reliable, meaningful
- Reflection
 - Continue
 - Make change

Wrap up

- Sustaining the momentum
 - Journaling
 - CATS- format, example
 - Matrix-format, example
 - Online discussion groups
 - Use of GAS process
- Opportunity to practice, answer own clinical questions

Follow up Evidence-Based Practice Activity

This will be an opportunity to analyze an article together as a group. The process is as follows:

1. I will identify a clinically based “foreground” question
2. About two-three days later I will post my thought processes in identifying the clinical question and the process I went through to actually get my hands on the article that I feel best addresses this question. In addition, I will provide a link to the article (or articles) so that you have it. You can compare your thought processes and article accessing process to what I did.
3. About 7-10 days after that, I will share my analysis of the article with you, including the level of evidence and the quality assessment, along with a brief discussion as to whether or not I would change my clinical practice based on the results of this article. Again, you can compare your thought processes and analysis with mine.
4. I will also include a copy of the way I would enter this into an excel matrix spread sheet, along with a CAT (see format at the end of this handout) based on the article.
5. I would be available, either over the phone or on email, to answer any questions you may have along the way.
6. The entire process should take about two weeks, so you would have that amount of time to get the article and complete your own analysis.

7. Ideally we will interact as a group online so that the team members can work through the process together.
8. This will be open to all employees of the staff, and not just the research team.

Critically Appraised Topic (CAT)

Topic Area:

QUESTION:

Clinical Bottom Line(s):

Summary of Key Evidence:

Appraisal and Application:

Other elements :

Citation:

Search Strategy:

Appendix E: Connolly Questionnaire

Attitudes and Perceptions Toward Research

Age: _____

Years Since Graduation: _____

Gender: _____

Rank your barriers (1 = greatest, 9 = least) to the use of research evidence in your clinical practice.

- ___ Insufficient time
- ___ Lack of information resources
- ___ Lack of research skills
- ___ Poor ability to critically appraise the literature
- ___ Lack of generalizability of the literature findings to my patient population
- ___ Inability to apply research findings to individual patients with unique characteristics
- ___ Lack of understanding of statistical analysis
- ___ Lack of collective support among my colleagues in my facility
- ___ Lack of interest

Please circle the most appropriate response

PT Degree: Certificate/BS/MS/MPT/DPT Clinical Specialist: Y / N

Access to internet at home: Y / N

Access to internet at workplace: Y / N

APTA Member: Y / N

Self-Reported Knowledge and Behaviors

1. I now regularly read either Physical Therapy or other peer-reviewed professional journals in my area of interest.
- | | | | | |
|----------------|-------|---------|----------|-------------------|
| 1 | 2 | 3 | 4 | 5 |
| Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
2. I have the necessary academic background to critically review the professional literature and draw my own conclusions about the validity and utility of the findings.
- | | | | | |
|----------------|-------|---------|----------|-------------------|
| 1 | 2 | 3 | 4 | 5 |
| Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
3. I currently feel comfortable with my level of knowledge in research terminology, research design, and validity and reliability issues as well as in ethical issues in physical therapy research.
- | | | | | |
|----------------|-------|---------|----------|-------------------|
| 1 | 2 | 3 | 4 | 5 |
| Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |

Source of Authority for Clinical Decision Making

4. The research findings published in Physical Therapy or similar professional journals are relevant to my own clinical practice and expertise.
- | | | | | |
|----------------|-------|---------|----------|-------------------|
| 1 | 2 | 3 | 4 | 5 |
| Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
5. Clinical practice should be based on outcome measure research and scientific studies that assess the usefulness of particular treatment regimens or protocols.
- | | | | | |
|----------------|-------|---------|----------|-------------------|
| 1 | 2 | 3 | 4 | 5 |
| Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
6. Clinical practice should be based on what other therapists and specialists have used as treatment protocols over the years and on what experts say works.
- | | | | | |
|----------------|-------|---------|----------|-------------------|
| 1 | 2 | 3 | 4 | 5 |
| Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |

Clinical Norms and Values About Research

7. Keeping current in the research literature in physical therapy is a lifelong professional responsibility of practicing physical therapists.

- | | | | | | |
|--|----------|-------|---------|----------|----------|
| | 1 | 2 | 3 | 4 | 5 |
| | Strongly | Agree | Neutral | Disagree | Strongly |
| | Agree | | | | Disagree |
8. Research in the profession of physical therapy is one of the responsibilities of the physical therapy clinician practicing in the field.
- | | | | | | |
|--|----------|-------|---------|----------|----------|
| | 1 | 2 | 3 | 4 | 5 |
| | Strongly | Agree | Neutral | Disagree | Strongly |
| | Agree | | | | Disagree |
9. I personally hope to be involved in the research process in the future on a regular basis.
- | | | | | | |
|--|----------|-------|---------|----------|----------|
| | 1 | 2 | 3 | 4 | 5 |
| | Strongly | Agree | Neutral | Disagree | Strongly |
| | Agree | | | | Disagree |
10. The physical therapists I have been exposed to in the field appear to place a high priority on the professional research in the field of physical therapy.
- | | | | | | |
|--|----------|-------|---------|----------|----------|
| | 1 | 2 | 3 | 4 | 5 |
| | Strongly | Agree | Neutral | Disagree | Strongly |
| | Agree | | | | Disagree |

Appendix F: Phase III Individual Interview

Introduction

Thank you again for your willingness to participate in this project. As you may remember, the focus of this research has been on the ways in which pediatric physical therapists use research evidence in their daily practice. I have worked with you and your colleagues at Physical Rehabilitation Specialists to determine if we could develop a program that meets your needs and interests for using research evidence in daily practice. The purpose of this phase of the project is to evaluate the outcomes of that program and to determine what, if any changes have occurred in your beliefs, attitudes, and behaviors with regard to evidence based practice.

The purpose of this interview is to revisit our discussion of the topic of evidence based practice. We discussed this topic during the first phase of the project, and this is an opportunity to think about and talk about any changes that may have occurred since that time. I'm also interested in how evidence based practice might relate to and influence the

clinical decisions you make in daily practice. This interview should take 45-60 minutes to complete. I'd like to tape record the interview so that later, I can transcribe it accurately and use this information, along with several other interviews to continue to build a picture of evidence based practice for some of the physical therapists who work for Physical Rehabilitation Specialists. As with the first interview, you will not be identified in any way. I will not use your name in any of the transcriptions or write ups of this interview. I will only use initials, or a participant identification number or a pseudonym. I will offer you a copy of the transcription for your review so that you can correct any inaccuracies. I'll also offer you a copy of any summaries and/or reports that result from this interview so that you can review my initial impressions. Do you have any questions before we begin?

Questions

The first part of this interview is directed towards the topic of making clinical decisions. Physical therapists make numerous clinical decisions every day. Tell me about some of the many clinical decisions you must make during a typical day.

During your daily routine, what factors influence how you make these various clinical decisions? What sorts of information do you consider?

How do you decide which factors are more important and which factors are less important?

Take a minute to think back to a child you worked with recently who presented as a difficult challenge. Tell me about that situation and how you went about responding to the challenges.

On the other hand, it seems that there are some fairly common injuries/disabilities that physical therapists work with. How do you keep yourself from being complacent? How do you make sure you're providing the most up to date interventions?

In general, how "eager/willing" or "not eager/willing" are you to try new things in physical therapy treatment?

Just to get a sense of how you work, tell me about a clinical situation where you tried something new.

What led you to make this decision? Was it successful? How did you evaluate the effectiveness of this "new" aspect of your treatment?

Next, I'd like talk with you about the concept of "evidence-based practice". This seems to be a topic that is discussed a lot in physical therapy these days.

First, how would you define the concept "evidence based practice"? How have you come to learn about this topic?

How would you know an Evidence Based Practitioner if you saw one? For example, what sorts of things might they do? What sorts of attitudes and/or behaviors might you see in this person?

How important, if at all, is it for pediatric physical therapists to be “Evidence Based Practitioners”? Why do you think this is so?

If you could place yourself on a continuum of Evidence Based Practice, with 1 being completely not being an evidence based practitioner and 10 being a complete evidence based practitioner, where would you put yourself today?

During the past year, what strategies, if any have you used in an effort to move in a positive direction on the continuum? How successful or unsuccessful have these attempts been? What has contributed to their success or lack of success?

At this point, in what ways, if any, would you like to “move” on the continuum? What are some strategies that might be effective in helping you move in a positive direction on the continuum? What are some things that might get in the way?

How, if at all, has participation in this project influenced your daily practice?

I’ve asked you several questions. Do you have any questions you’d like to ask me?

Are there any questions that I didn’t ask that you think I should have asked?

Thanks.

Appendix G: Phase III Focus Group Interview

Introduction

Thank you again for your willingness to participate in this project. I appreciate your taking time to meet with me again. As you know, the focus of this project has been to develop an increased understanding of physical therapists’ beliefs, attitudes, and behaviors with regard to evidence based practice. In addition, we have all worked together to develop a program that meets your needs and interests for using research evidence in daily practice. We are now at the phase where we are evaluating the outcomes of this program.

Recently I’ve talked with you all individually. From those interviews, I got a pretty good sense as to where you’re each at individually with evidence based practice and your overall impressions of this project. The purpose of this group interview is to delve into these topics further, this time with the advantage of having several different people’s opinions at the same time.

This group interview should take about 45-60 minutes to complete. Again, I'd like to tape record the interview so that later, I can transcribe it accurately and use this information, along with a variety of other information to continue to build a picture of evidence based practice here at Physical Rehabilitation Specialists.

Once again I'd like to emphasize the importance of being completely forthright and honest with your responses to my questions. Some of my questions will be directed towards your opinion of the effectiveness of this project. Please do not feel like you need to respond in any particular way, or that you need to "tell me what I want to hear." There are no "right" or "wrong" answers.

Finally, with regard to the interview transcriptions, you will not be identified in any way. I will not use your names in any of the transcriptions or write ups of this interview. I will only use initials, or a participant identification number or a pseudonym. I will offer you each a copy of the transcription for your review so that you can correct any inaccuracies. I'll also offer you a copy of any summaries and/or reports that result from this interview so that you can review my initial impressions. Do you have any questions before we begin?

The time frame that we are considering with this interview is August/September 2006 until March 1, 2007.

First, by participating in this project, you indicated a willingness to think about and come up with ways to try to improve your knowledge, understanding, and application of evidence based practice. In what ways, if any, have you improved? What has supported or enhanced your efforts to improve? What has gotten in the way?

How, if at all, has your clinical practice changed over the past six months?

The main group strategy that we used to help improve evidence based practice was the workshop in August and the follow up online discussion. How helpful was the workshop? There seemed to be little follow up or group interest in the online group discussion- why do you think this was so?

During our interviews, you've each shared with me some of the strategies you have utilized in an attempt to improve your evidence based practice skills and activities over the past six weeks. It would be helpful if each of you would be willing to share the strategies that you've utilized and your sense of the effectiveness of those strategies.

What did you notice about each other's strategies?

In what ways, if any, does the Practice support evidence based practice?

In what ways, if any, do the institutions where you work each day support evidence based practice?

In moving forward, what would be helpful to you as an individual to continue to improve in your evidence-based practice skills and in your clinical practice?

What do you think would be most helpful for pediatric physical therapists in general?