FACTORS AFFECTING THE PROPENSITY TO ADOPT EVIDENCE-BASED PRACTICE IN PHYSICAL THERAPY

by

PATRICIA HULSEY BRIDGES

(Under the Direction of Laura L. Bierema)

ABSTRACT

Many authors, as well as the American Physical Therapy Association, are advocating that physical therapy move to a practice based on research evidence known as "evidence-based practice." This study sought to explain factors that affect the propensity of physical therapists to adopt evidence-based practice. 1,320 physical therapists licensed by the state of Georgia were surveyed on their perception of their propensity to adopt evidence-based practice, personal characteristics, characteristics of the social system in the workplace, and selected demographic variables.

A self-completion forced choice survey instrument was used. Three instruments were embedded in the survey instrument: a *Psychometric Instrument* developed by Green, Gorenflo, and Wyszewianski (2001), the short form of the *Dimensions of the Learning Organization Questionnaire* (Watkins & Marsick, 1998; Yang, Watkins, & Marsick, 2002), and the *Self-directed Learning Readiness Scale for Nurse Education* (Fisher, King, & Tague, 2001). In addition seven demographic variables were included in the survey.

The findings demonstrated that the best three variable model for predicting the propensity to adopt evidence-based practice in physical therapy included: desire for learning, the highest

degree held, and practicality. These findings have implications for managers of physical therapy departments, adult educators, and educators of physical therapy students.

INDEX WORDS: Evidence-based Practice, Learning Organization, Physical Therapy, Organizational Learning, Self-directed Learning

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DEDICATION

This dissertation is dedicated to my husband, Al Bridges, my son, Tripp Bridges, my mother, Roberta Hulsey, and my daddy, Jake Hulsey.

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CHAPTER 1

THE PROBLEM

Today as never before there is a plethora of information available to guide healthcare professionals in making clinical decisions. However, some physical therapists continue to make clinical decisions based on the opinions of experts, clinical experience, intuition, or what they learned in school (Closs & Lewin, 1998; Duncan, 1996; Rothstein, 1997, 2000; Turner & Whitfield, 1997). This in part may be because physical therapy continues to wrestle with identifying its own body of knowledge (Blood et al., 2000) and appropriate methods by which to assess the body of knowledge (Bithell, 2000; Swinkels, Albarran, Means, Mitchell, & Stewart, 2002). Furthermore, the research base in physical therapy is limited in terms of evidence from randomized control trials (RCTs) and meta-analysis on the most effective treatment interventions (Swinkels et al., 2002). Others in the profession hold there is a gap between what is known and what is done (Cormack, 2002). The information is available, but physical therapists are unaware of its existence or unable to make use of the information (Bouchier, 1997). Some physical therapists report having difficulty finding, assessing, interpreting, and translating into clinical practice the best current research evidence (Haynes & Haines, 1998; Jette et al., 2003). In the midst of this professional milieu, a movement toward physical therapy practice based on research evidence known as evidence-based practice (EBP) is being promoted in the United States.

Leaders in physical therapy, however, have been advocating a research and evidence-based approach to the practice of physical therapy for two decades. In 1982, Eugene Michaels, a prominent leader in physical therapy, supported research evidence of the effectiveness of

physical therapy treatments (Michaels, 1982). Advocacy of a research evidence-based approach to examination and treatment interventions provided by physical therapists has continued (Blood et al., 2000; Duncan, 1996; Rothstein, 1997, 2000, 2001; The Clinical Research Agenda Conference Participants, 2000). Recently, the American Physical Therapy Association has established the salience of EBP in *Vision 2020*:

> Guided by integrity, life-long learning, and a commitment to comprehensive and accessible health programs for all people, physical therapists and physical therapy assistants will render evidence-based service through out the continuum of care and improve quality of life for society. (American Physical Therapy Association, 2002, HOD06-00-24-35, para.3)

Nonetheless, recent reports suggest physical therapists in day-to-day practice have not based their clinical decisions on research evidence (Duncan, 1996; Miller, 1994; Turner & Whitfield, 1997). The results have been a marked variation in practice among physical therapists. The scenario that follows illustrates the problem.

In 1994 Lisa Miller, a reporter for the *Wall Street Journal*, took her complaints of chronic knee pain to five different physical therapists after receiving a prescription for “physical therapy three times a week” from a physiatrist, a medical doctor, who specializes in physical medicine. All physical therapists agreed with the physiatrist’s findings that the patella (the knee cap) didn’t track properly which caused discomfort and degeneration. Also, all agreed that some combination of stretching and strengthening exercises was the solution. The similarities ended there. Miller received a variety of diagnostic procedures, many variations in exercises, electrical stimulation, ultrasound, and orthotics for the treatment of her knee. The suggested number of treatments ranged from one to three times a week (Miller, 1994). Unfortunately, this scenario is

not an isolated incident. Wide variation in how physical therapists treat patients with similar problems is epidemic in the United States (Duncan, 1996). Practices are highly variable, based on anecdote, or the opinions of authorities, and not based on evidence (Duncan, 1996; Rothstein, 2001).

In making clinical decisions, physical therapists have traditionally drawn on clinical observations, clinical experience, clinical judgment, intuition, the opinions of experts, and the opinions of colleagues; consulted textbooks and journals; or relied on what they learned in their initial training (Closs & Lewin, 1998; Duncan, 1996; Rothstein, 1997, 2000; Turner & Whitfield, 1997). Research of treatment interventions has always contributed to clinical decision-making (Swinkels et al., 2002). However, staying abreast of the relevant research findings is nearly impossible (Forrest, 2001). Turner and Whitfield (1997) found that the best current research evidence was rarely applied to patient care by physical therapists. Consequently, useful treatments are not provided and ineffective and even harmful treatments are continued (Forrest, 2001).

The following sections will describe the practice of physical therapy, define EBP, describe the adoption of EBP in physical therapy, discuss the factors affecting the propensity to adopt EBP, present the theoretical framework on which the study is based, and describe the purpose of the study.

Practice of Physical Therapy

The *Guide to Physical Therapy Practice* defines physical therapy as: “a profession with an established theoretical and scientific base that has widespread application in the restoration, maintenance, and promotion of optimal physical function” (Rothstein, 2001, p. 13). Specifically, physical therapists:

- Diagnose and manage movement dysfunction and enhance physical and functional abilities.
- Restore, maintain, and promote not only optimal physical function but also optimal wellness and fitness and optimal quality of life as it relates to movement and health.
- Prevent the onset, symptoms, and progression of impairments, functional limitations, and disabilities that may result from diseases, disorders, conditions, or injuries. (Rothstein, 2001, p. 21)

History of Physical Therapy

The first physical therapists, known as "reconstruction aides," came on the scene after World War I when nurses took courses in rehabilitation to prepare them to treat veterans with war wounds. Physical education majors, as well as nurses, attended rehabilitation courses to meet the demands of people with polio in the 1930s and 1940s. After World War II these same professionals provided treatment to veterans. Today physical therapists receive a master's level degree or doctor of physical therapy degree after first completing a baccalaureate education and must pass a licensing exam in the state in which they practice (Miller, 1994).

Historically, one therapist teaching another, often by demonstration, transmitted a substantial body of knowledge in physical therapy. The emphasis was on the "how to" aspect. The physical therapist as a transmitter of an art form encouraged limited variation in the technique that was demonstrated. Practice was justified on the basis of personal observation and clinical experience (Peat, 1981).

Physical therapists have become increasingly aware of the importance of theory in research and practice (Tammivaara & Shepard, 1990). Today scientifically based models for interventions exist. However, the current paradigm in physical therapy continues to be primarily

based on expert opinion and clinical experience (Duncan, 1996). Leaders in the profession have expressed grave concern over the lack of research evidence to support the treatment interventions (Duncan, 1996; Rothstein, 1997, 2001). Recently, Rothstein espoused, "The profession of physical therapy will soon find itself in a world of hurt before long unless it soon abandons 'edict-and guru-based' practice in favor of treatments and techniques backed by hard evidence of efficacy" (as cited in Smith, 2001, p. 20).

Physical therapists will need to provide evidence that treatment interventions are safe and effective or risk no reimbursement from third party payers. Is there a solution to moving the profession from pseudoscientific physical therapy to a practice based on research and evidence of effectiveness? Opinion leaders have suggested using the evidence-based approach in the day-to-day practice of physical therapy to move the profession toward practice guided by clinically relevant studies and research (Duncan, 1996; Jette et al., 2003 Rothstein, 2001).

Movement Toward EBP in Physical Therapy

During the last decade a new paradigm has began to emerge. Some physical therapists are shifting from practice based on tradition, expert opinion, unsystematic clinical experience, and intuition, to practice based on examinations and interventions that are backed by client centered research and other scientific studies (Jette et al., 2003). Good clinical practice has shifted to assessments and interventions based on clinical research. Physical therapists are now looking toward research and evidence-based interventions from which to practice.

Evidence-based practice is a method for identifying, evaluating, and implementing good clinical data. In order for physical therapists to remain effective providers of healthcare, they must use research evidence for examinations and treatment interventions.

Evidence-based Practice

The most common definition for evidence-based medicine/practice is from the Evidence-based Medicine Working Group: Evidence-based medicine is "the conscientious, explicit and judicious use of current best research evidence in making decisions about individual patients" (Sackett, Rosenberg, Gray, Haynes & Richardson, 1996, p. 71). The definition was modified to include patient values in 2000. "Evidence-based medicine is the integration of best research evidence with clinical expertise and patient values" (Sackett, Straus, Richardson, Rosenberg, & Haynes, 2000, p. 1). This document will hereafter use the term EBP to refer to evidence-based medicine or evidence-based practice. "The use of best evidence primarily refers to scientific evidence derived from research" (Bury, 1998, p. 7).

The Effects of Adoption of EBP

The shift to EBP has the potential to standardize assessments, interventions, and practice guidelines. The efficacy, appropriateness, and quality of physical therapy care will be improved. Interventions with research evidence to support the best possible outcomes will be consistently prescribed, and the variation in physical therapy practice will be reduced. Furthermore, it is hoped that research evidence for physical therapy assessments and interventions will be increased (Cormack, 2002).

In medicine, the advent of RCTs has lead to a rapid increase in the quantity and quality of clinically valid evidence concerning history taking, examination, differential diagnosis, prognosis, and interventions (Sackett & Rosenberg, 1995). Ebell (personal communication, April, 2002) estimates that 40-60% of medical practices are currently based on research evidence. Although physical therapy would benefit from EBP, it cannot be assumed that the rapid shift that has occurred in medicine will take place in physical therapy. Physical therapy is

characterized by a different educational preparation and management structure (Thomas et al., 2002). Furthermore, there is a concern that physical therapy treatment interventions may not respond well to RCTs because there is an element of art in providing physical therapy interventions as well as scientific application (Bithell, 2000).

Evidence-based practice will de-emphasize intuition, unsystematic observations, and opinions of "authorities" (Evidence-Based Medicine Working Group, 1992). An example of research evidence supplanting intuition in everyday practice follows. Schell (1994) in supporting the value of occupational therapists' intuition in clinical decision-making cites an example of an occupational therapist who intuitively held a trash can for a patient with hemiparesis (weakness on one side of the body) forcing the patient to use his weak hand to throw away a cup. The outcome was forced use of the weak arm. This example of a treatment intervention based on unsystematic clinical observation and guided by intuition should and will be replaced by treatment interventions based on research evidence as treatment interventions are subjected to scientific studies. Blanton and Wolf (1999) initiated this important research on forced use of a weak extremity known as constraint-induced therapy. The researchers constrained the unaffected extremity coupled with functional movements of the weak extremity for two weeks in a 61-year-old woman with upper extremity hemiparesis. Pretreatment to post treatment and from post treatment to follow-up measurements demonstrated improvements on tests designed to test motor function and activity. Blanton and Wolf (1999) concluded that the encouraging improvements demonstrated in the case study suggested the need for a research design that would explore constraint-induced therapy in detail. Additional research evidence for constraint-induced therapy has been demonstrated in a random clinical trial of 20 patients by Dromerick, Edwards, and Hahn (2000). They found that constraint-induced therapy was associated with less arm

impairment at the end of treatment. The researchers concluded that long-term studies are needed to determine whether constraint-induced therapy is more effective than traditional therapies in early post stroke rehabilitation.

As additional longitudinal studies with larger numbers of subjects are carried out, the effectiveness of constraint-induced therapy will be substantiated or rejected. If constraint-induced therapy is demonstrated through RCTs to be more effective in improving the strength of weak upper extremities in early post stroke rehabilitation than traditional therapy, physical therapists and other health care professionals will have the research evidence to support constraint-induced therapy as an effective mode of therapy in rehabilitating the motor control of the upper extremity. As more research evidence is generated, clinical decisions can and should be based on the best available research evidence rather than a spontaneous idea generated during another activity that leads to an intuitive thought generating the next activity such as the treatment intervention described by Schell (1994).

Finally, evidence-based methods for making clinical decisions are also necessary for maximizing quality and cost-effectiveness of care (Sackett et al., 1996). The 1998 President's Advisory Commission on Consumer Protection and Quality in the Health Care Industry reported that improving healthcare will require a commitment to delivering healthcare based on sound scientific evidence (Rosswurm & Larabee, 1999).

Factors Affecting the Propensity to Adopt EBP

According to Bithell (2000), editor of *Physiotherapy*, a British journal of physical therapy, physiotherapists (the British term for physical therapists, hereafter referred to as physical therapists) have a positive view toward EBP: "As clinicians we seek to establish evidence-based practice because we wish to show that our treatments are effective and supported

by well conducted research" (p. 58). Yet, she observes there is a significant difference between problems faced by medical doctors and physical therapists when seeking evidence for making clinical decisions. For the doctor the problem is an overload of information available.

For the physical therapist, the problem is a scarcity of high quality evidence available regarding physical therapy interventions (The Clinical Research Agenda Conference Participants, 2000). At present, physical therapists do not have the research evidence to codify evidence-based guidelines for practice. However, thirty conditions have been identified for which physical therapists are submitting summaries of clinical studies with outcome data from peer-reviewed articles to the online database, *Hooked on Evidence* (http://apta.org/hookedonevidence). When the online database is in its final phase, a comprehensive database will be available for physical therapists, who are members of the American Physical Therapy Association to efficiently search for relevant evidence to support their treatment interventions. In addition, it is hoped that evidence will be sufficient to develop evidence-based guidelines for physical therapy (Coyne, 2002).

At this writing, physical therapists have at their disposal *The Guide to Physical Therapy Practice*, a description of "preferred practice patterns for selected patient/client diagnostic groups" (Rothstein, 2001, p. 7), and some evidence-based clinical practice guidelines such as rehabilitation interventions for low back pain (The Philadelphia Panel, 2001), knee pain (The Philadelphia Panel, 2001), neck pain (The Philadelphia Panel, 2001), and shoulder pain (The Philadelphia Panel, 2001).

In order to use EBP in day-to day practice, busy physical therapists will need "bottom line" answers to their questions and they will need them quickly (Foster, Barlas, Chesterton, & Wong, 2001; Slawson, Shaughnessy, & Bennett, 1994). Efforts to make information available in

digestible bites come in many forms (Foster et al., 2001). The *Cochrane Database of Systematic Reviews* has been invaluable in answering this need for physicians. The *Cochrane Database of Systematic Reviews* is an electronic journal of systematic reviews based on the results of RCTs or the best available research evidence from other sources when RCTs are not available. The journal is updated quarterly by a group of collaborating authors using explicitly defined methods (Bero & Rennie, 1995). The *Cochrane Database of Systematic Reviews* can also be useful to the physical therapists wishing to access the wider medical literature. Two computer products, which help inform day-to-day practice for physicians in a quick and efficient manner are *Best Evidence* (Foster et al., 2001) and *Inforetriever* (Ebell, 1999). *Bandolier* and the *Journal of Family Practice POEMS* newsletter are examples of monthly publications that summarize research evidence findings (Foster et al., 2001). Pedro (http://www.pedro.fhs.usyd.edu.au) is a physical therapy Internet database that rates the level of evidence (Foster et al., 2001). The Chartered Society of Physiotherapist in Great Britain has begun publishing a quarterly summary of evidence, the *Physiotherapy Effectiveness Bulletin*. The journal evaluates research evidence for physical therapists by clinical specialists using the Cochrane criteria (Swinkels et al., 2002). Foster et al. (2001) have suggested that physical therapy departments develop critical appraisal summaries on the most frequently seen diagnostic categories by the department and publish the summaries for all staff members.

Even though physical therapists have less information available, physical therapists generally have positive attitudes toward EBP. The results of the study by Jette et al. (2003) found that physical therapists, who were members of the American Physical Therapy Association (n = 477), believe the use of evidence in practice is necessary, that the literature is useful to them in clinical decision-making, and that the quality of patient care is superior when evidence is used.

Barnard and Wiles (2001) sought to explore physical therapists' views and experiences on EBP in Great Britain. Focus groups and interviews were held with 56 physical therapists in a variety of different settings within the National Health Service in the Wessex area of England. Respondents identified four advantages of evidence-based practice: (1) improved relationships with other health professionals, (2) better working conditions for physical therapists, (3) a secure future for the profession, and (4) better service for patients. In addition, the participants expressed fear that unless physical therapy moved toward a solid EBP, other professions such as chiropractic and osteopathy would supplant it.

Barriers to EBP

The development of EBP will depend on physical therapists' ability to use and generate research evidence in their day-to-day practice. Closs and Lewin (1998) surveyed dieticians, occupational therapists, physical therapists, and speech and language therapists regarding barriers to research utilization. All respondents felt there was insufficient time to implement ideas and read research. Furthermore, they believed there was a need for organizational support, from material items such as library facilities to less tangible support from colleagues and managers, and a necessity for a change in culture. Eldridge and South (1998) reported there has been a growing recognition that circumstances required to integrate evidence into practice must have an organizational dimension because clinicians alone cannot change all the factors that shape practice.

Studies in England and Australia suggest the findings of research evidence were not being implemented in the routine, clinical practice of physical therapists. Turner and Whitfield (1997) surveyed dieticians, occupational therapists, physical therapists, and speech and language therapists regarding their reason for choice of treatment interventions. The authors found over

90% of each group's choice of treatment intervention reflected what was taught in their initial training (Turner & Whitfield, 1997). Jette et al. (2003) found that the primary barrier to use of evidence in practice was insufficient time. Bury (1998) identified multiple barriers that may affect the adoption of EBP into physical therapy. Some of these barriers include: "gaps in evidence, not enough high quality evidence, and available evidence that is out of date or even wrong" (p. 23). As the volume and quality of research increases in the field of physical therapy, many of these barriers should be removed. In addition, characteristics of the social system in which EBP will be implemented may affect the adoption of EBP. Time and effort required to carry out the EBP process and lack of skills in the EBP process may be related to the degree of an individual's perception of their degree of readiness for self-directed learning. The next section will discuss the positive influence of characteristics of the social system and personal characteristics on the adoption of EBP.

Factors that may Positively Affect the Adoption of EBP

Personal characteristics and the characteristics of the social system have been identified as factors that lead to change in clinical practice such as the adoption of an innovation like EBP (Cervero, 1985; Fox & Bennett, 1998). This section will review factors that may positively affect the propensity to adopt EBP.

Squire and Cullen (2001) posit that there needs to be a culture of learning at the organizational level that encourages practitioners to challenge current practices and empowers them to seek evidence of the reliability and validity of examinations and treatment interventions. Gray (1998) further suggests that individuals alone cannot deal with knowledge. The organization where clinicians work must recognize and manage knowledge as a resource. Senge (1990) popularized the movement of organizations toward creating environments where learning

and innovation are advocated and rewarded. The new movement is known as the learning organization.

The characteristics of a learning organization appear to be consistent with a positive approach to adopting new practices. Watkins and Marsick (1993, 1996) have codified seven complementary action imperatives that are essential to the learning organization: (1) continuous learning opportunities are available, (2) inquiry and dialogue are encouraged, (3) collaboration and team learning are promoted, (4) systems to capture and share learning are put in place, (5) people are enabled to work toward a collective vision, (6) the organization is connected to its environment, and (7) the leaders model and support learning.

The learning organization facilitates learning of the individual, team, and organization. Several scholars have included self-direction as a key element of the learning organization (Kline & Saunders, 1993; Marquardt, 1996; Watkins & Marsick, 1993). Watkins and Marsick (1993) have reported that self-directed learning in the workplace was central to continuous learning. Self-directed learning has been described by numerous scholars: (Brockett, 2002; Brockett & Heimstra, 1991; Brookfield, 1985; Candy, 1991; Fisher, King, & Tague, 2001; Garrison, 1997; Guglielmino, 1977; Knowles, 1975; Linares, 1999; McCune, 1988; Mezirow, 1981; Oddi, 1984; Skager, 1984; Spear & Mocker, 1984; Tough, 1979).

Investigation of the prevalence of self-directed learning among physical therapists will add to the understanding of the propensity to adopt EBP. The process of EBP involves identification of a problem, comparison of interventions for the best available research evidence, and integrating the findings with clinical expertise and patient values (Forrest, 2001). These processes necessarily involve intentional learning by the physical therapist and a determination by the physical therapist of what is to be learned and how. The responsibility for practicing the

EBP process as opposed to relying on the opinions of experts, past clinical experience, or protocols is the primary responsibility of the physical therapist in providing the best care for a patient. Accepting the responsibility for learning and research in order to carry out the evidence-based research process is an essential characteristic of the self-directed learner.

Based on a review of the literature, self-directed learning for this study will be defined follows:

> The amount of responsibility the learner accepts for his or her own learning. The self-directed learner takes control and accepts the freedom to learn what they view as important for themselves. The degree of control the learner is willing to take over their own learning will depend on their attitude, abilities, and personality characteristics. (Fisher et al., 2001, p. 516)

Studies of the readiness of physical therapists for self-directed learning have involved students (Linares, 1999). Little is known about the readiness for self-directed learning among practicing physical therapists and the influence of the physical therapist's perception of themselves as a self-directed learner on the propensity to adopt EBP.

Other individual factors may impact the propensity to adopt EBP. The concept of EBP marks a shift from practice guided by the opinions of authorities to practice based on clinically relevant studies and research. Adoption of EBP may require a physical therapist to depart from a traditional protocol that is practiced in their community or propagated by opinion leaders (Delitto, 1998). Clinicians will need to keep an open mind (Hurley, 2000) and be willing to "diverge from common or previous practice" (Green, Gorenflo, & Wyszewianski, 2002, p. 2). In other words, they will need to be nonconformists. Nonconformity has been defined by Green et

al. (2002) as the “degree of comfort with engaging in clinical practices that are out of step with how others in the local community provide care or what opinion leaders recommend” (2002, p. 5). Thus, nonconformity may impact the propensity of a physical therapist to adopt EBP.

Because time is said to be a chief barrier to adoption of EBP (Bury, 1998; Jette et al., 2003), the belief by a physical therapist that EBP fits the practice world of a physical therapist may impact the propensity to adopt EBP. Practicality has been defined for this study as the belief by physical therapists that evidence-based guidelines and scientific studies can be used to make clinical decisions in the day-to-day practice of physical therapy without interfering with productivity or the smooth and orderly flow of patients (Green et al., 2002). Finally, there may be an association between demographic variables and the propensity to adopt EBP.

The significance of the characteristics of EBP, the personal characteristics of physical therapists, and the presence of the characteristics of the learning organization in the social system into which EBP is diffused are understood in the context of a model developed by Cervero (1985). The next section will discuss the theoretical framework undergirding this study.

Theoretical Framework

Building on the diffusion of innovation work by Rogers and Shoemaker (1971) and Rogers (1983), Cervero (1985) developed a model explaining behavioral change by professionals after attending a continuing professional education course. The characteristics of the continuing professional education program, the characteristics of the individual professional, the type of change, and the social system in which the professional must implement the change were the elements included in the model. This study replaces the continuing education program from Cervero’s model (1985) with the innovation, EBP. The next section will describe the elements as they relate to the propensity to adopt EBP. These four elements, characteristics of the innovation,

characteristics of the individual, proposed type of change, and characteristics of the social system form the theoretical framework for this study. An explanation of each of the elements follows.

Characteristics of the Innovation

The characteristics of an innovation may affect the adoptability of a new idea (Cervero, 1985). Rogers and Shoemaker (1971) and Rogers (1983) identified five characteristics of the innovation that affect the rate of adoption based on the individual's perception of the innovation: the relative advantage of the innovation, compatibility of the innovation, complexity of the innovation, trialability of the innovation, and observability of the innovation.

The relative advantage of EBP for the profession of physical therapy has been described by Bury (1998), Cormack (2002), Duncan (1996), and Rothstein (2001) as a shift from a pseudoscientific practice to a practice based on research evidence that will result in improved patient care. The lack of compatibility of EBP with the current practice of physical therapists was described by Closs and Lewin (1998), Duncan (1996), Rothstein (1997, 2000), and Turner and Whitfield (1997). They reported that physical therapists practice based on opinions of experts, clinical experience, intuition, or what they were taught in school. Eldridge and South's study (1998) suggests the complexity of EBP may be a factor that limits adoption. At this time, EBP for physical therapists involves complex research skills such as searching the literature and critically appraising the literature. The trialability of EBP would appear to favorably influence the adoption. Physical therapists can "try out" EBP by supporting any treatment intervention with the best available research by using *CINAL*, *Medline, PEDro, PubMed* or other evidence-based databases to search the efficacy of the treatment intervention. Observation of physical therapists using EBP to successfully receive reimbursement for their services may lead to adoption. It is essential that all healthcare personnel demonstrate accountability for examinations

and interventions they administer. Evidence-based practice is a systematic method of answering: is "…the right person, doing the right thing, the right way, in the right place at the right time, with the right result" (Graham, 1996, p. 11).

Characteristics of the Individual

The characteristics of the individual have been recognized as impeding or facilitating the rate of adoption. The individual professional who will or will not change behavior is an important factor in the adoption of EBP (Cervero, 1985). The characteristics of the individual physical therapist, which predispose EBP adoption, were studied by Eldridge and South (1998). They found that physical therapists, which had completed a research course as part of the undergraduate or graduate training were more likely to be involved in research on outcome measures. Schön (1983) has described the characteristics of the reflective practitioner. "As he [sic] tries to make sense of it, he [*sic*] also reflects on the understandings which have been implicit in his [*sic*] action, understandings which he surfaces, criticizes, restructures, and embodies in further actions" (p. 50). Ebell (1999) suggests that it is this critical reflection by a clinician on their practice that leads to developing clinical questions that result in identification of problems that are answered through tracking down the best research evidence. Self-directed learning, a form of study in which individuals take responsibility for planning, conducting, and evaluating their learning activities, would seem to be an essential characteristic of the individual professional who adopts EBP (Knowles, 1975). Numerous researchers have described the personal attributes of the self-directed learner (Brockett, 2002; Brockett & Heimstra, 1991; Fisher et al., 2001; Garrison, 1997; Grow, 1991; Guglielmino, 1977; McCune, 1988; Oddi, 1984; Skagar, 1984). Green et al. (2002) have identified two attributes, "willingness to diverge from common or previous practice" and "sensitivity to the pragmatic demands of practice" (p. 2),

which would seem to affect the propensity to adopt EBP. Finally, the demographic variables of the individual physical therapists may impact the propensity to adopt EBP.

Proposed Type of Change

The proposed type of change will also affect the rate of adoption. The type of change is defined for this study as a shift in the paradigm of the practice of physical therapy from clinical decisions based on tradition, expert opinion, intuition, unsystematic clinical observation, and pathophysiological rationale to an emphasis on clinical decisions that are based on the integration of best research evidence with clinical experiences and patient values (Kessenich, Guyatt, & DiCenso, 1997; Rosenberg, Gray, Haynes, & Richardson, 1996; Sackett et al., 1996). The change will not take place in a vacuum. Rather, the social system in which EBP will be implemented must be taken into account (Cervero, 1985).

Characteristics of the Social System

The characteristics of the social system are important in determining the propensity to adopt EBP. Physical therapists learn from their work with patients, on teams with other health care professionals, and in dialogue with their colleagues (Fox & Bennett, 1998). However, the current workplace environment for many physical therapists is not conducive to learning and researching the evidence for treatment interventions. Research takes time. Reflection takes time. Dialogue takes time. Efforts to contain costs have resulted in expectations that individual physical therapists produce an allotted number of treatment units per day. Under current guidelines therapists are expected to bill six hours of patient care services per day. It is a challenge for physical therapists to meet the productivity standards and carry out the other activities that are essential to the job such as documentation of services, patient conferences, team meetings, entering charges, and making phone calls to physicians, prosthetists, orthotists,

and/or occupational therapists. These disincentives work against the adoption of EBP. On the other hand, the presence of the dimensions of the learning organization as described by Watkins and Marsick (1993, 1996) have the potential to provide the incentives within the work environment that will facilitate the propensity to adopt EBP.

Knowing the factors that affect the propensity of physical therapists to adopt EBP will provide empirical support for managers of physical therapy departments and adult educators who work to design learning organizations and facilitate research evidence seeking behaviors among physical therapists. The study sought to correlate the characteristics of two of the four factors in the Cervero model (1985), characteristics of the social system in the workplace and personal characteristics of physical therapists with a shift in the paradigm from provision of patient care services based on tradition, expert opinion, unsystematic clinical observation, intuition, and pathophysiologic rationale to the propensity to provide assessment and interventions that are based on the best available research evidence.

Problem Statement

Healthcare in the Western world is undergoing a revolution. The traditional decision making paradigm that relies on tradition, expert opinion, unsystematic clinical observation, intuition, and pathophysiologic rationale is being replaced with one that is grounded in research evidence on the effectiveness of physical therapy practices. The new paradigm is referred to as EBP. Unfortunately, some physical therapists continue to make clinical decisions based on tradition, opinions of experts, unsystematic clinical observation, intuition, or what they learned in their initial training (Closs & Lewin, 1998; Duncan, 1996; Rothstein, 1997, 2000; Turner & Whitfield, 1997).

Much of the literature on EBP focuses on defining it, developing EBP skills, and applying them in practice. Studying the interventions that influence the change in physician's behavior to EBP has also been a primary focus. If the transformation to EBP is to become a reality in the practice of physical therapy, it is important to understand the factors that facilitate and inhibit the diffusion of EBP from a physical therapist's point of view. Several studies have investigated the barriers to adoption of EBP by physical therapists in Great Britain (Bury, 1998; Closs & Lewin, 1998). There is even less information on factors that facilitate the adoption of EBP by physical therapists. Little is known about the personal characteristics of physical therapists that influence the propensity to adopt EBP. Also, there is a paucity of research on the influence of the characteristics of the social system in which physical therapists practice on the propensity to adopt EBP. If EBP is to become a reality in the day-to-day practice of physical therapists, the factors that predict adoption need to be empirically tested. Based on the empirical findings, a framework for implementation of EBP in departments of physical therapy can be developed.

Purpose of the Study

The purpose of this study was to determine to what extent individual factors and the characteristics of the social system in the workplace influence the propensity of physical therapists to adopt evidence-based practice. The study was guided by the following questions:

1. To what extent do personal characteristics predict the propensity to adopt evidence-based practice?
2. To what extent do the characteristics of the social system in the workplace predict the propensity to adopt evidence-based practice?

3. To what extent do a combination of personal characteristics and the characteristics of the social system in the workplace predict the propensity to adopt evidence-based practice?

Significance

Prior research has identified barriers to the adoption of EBP by physical therapists (Bury, 1998; Closs & Lewin, 1998; Jette et al., 2003). There is, however, little to no literature that specifically addresses factors that predict the propensity to adopt EBP by physical therapists. This study adds to the body of knowledge on adoption of innovations, empirical support for the influence of desire for learning, nonconformity, practicality, and highest degree held on a particular innovation, propensity to adopt EBP.

The study provides significant findings for managers of physical therapy clinics and adult educators relating to designing models to implement a particular innovation, EBP. Identification of the factors that affect the propensity to adopt can be used to develop an empirically based model for implementing EBP.

In addition, those involved in curriculum development of physical therapy programs may benefit from the findings of this study. Sackett and Rosenberg (1995) have suggested that the practice of EBP is a process of life-long, self-directed learning in which the practitioner experiences a need for clinically relevant information as he or she provides care for patients. They have suggested a particular research process to follow to locate the information. Slawson et al. (1994) have introduced an alternate user-friendly method of managing new information in a more time efficient manner. Both processes required self-directed learning. This study provided empirical evidence that desire for learning, a component of self-directed learning, predicts the

propensity to adopt EBP by physical therapists. Curricula in the entry-level programs for physical therapy should be designed to develop life long self-directed learners.

Definitions

Evidence-based practice: “is the integration of best research evidence with clinical expertise and patient values” (Sackett et al., 2000, p. 1). Evidence-based practice will de-emphasize intuition, unsystematic observation and opinions of “authorities” (Evidence-Based Medicine Working Group, 1992).

Learning Organization: The learning organization is one that learns continuously and transforms itself. Learning takes place in individuals, teams, the organization, and even the communities with which the organization interacts. Learning is a continuous strategically used process–integrated with, and running parallel to, work. Learning results in changes in knowledge, beliefs and behaviors. Learning also enhances organizational capacity for innovation and growth. The learning organization has embedded systems to capture and share learning. (Watkins & Marsick, 1993, pp. 8-9)

Nonconformity: The “degree of comfort with engaging in clinical practices that are out of step with how others in the local community provide care or what opinion leaders recommend” (Green et al., 2002, p. 5).

Organizational Learning: “A change process that enhances an organization’s capability to acquire and develop new knowledge. It is aimed at helping organizations use knowledge and information to change and improve continuously. It involves discovery, invention, production, and generalization” (Cummings & Worley, 2001, p. 674).

Physical Therapists: Health care professionals that:

- Diagnose and manage movement dysfunction and enhance physical and functional abilities.
- Restore, maintain, and promote not only optimal physical function but optimal wellness and fitness and optimal quality of life as it relates to movement and health.
- Prevent the onset, symptoms, and progression of impairments, functional limitations, and disabilities that may result from diseases, disorders, conditions, or injuries. (Rothstein, 2001, p. 21)

Practicality: The belief by physical therapists that evidence-based guidelines and scientific studies can be used to make clinical decisions in the day-to-day practice of physical therapy without interfering with productivity or the smooth and orderly flow of patients (Green et al., 2002).

Propensity to adopt evidence-based practice: A preference toward the belief that "scientific evidence is perceived as the best source of knowledge about what constitutes good practice as opposed to clinical experience and authority" (Green et al., 2002, p. 5).

Self-directed learning:

The amount of responsibility the learner accepts for his or her own learning. The self-directed learner takes control and accepts the freedom to learn what they view as important for themselves. The degree of control the learner is willing to take over their own learning will depend on their attitude, abilities and personality characteristics. (Fisher et al., 2001, p. 516)

CHAPTER 2

LITERATURE REVIEW

Introduction

The purpose of this chapter is to review the relevant literature associated with the study. The review of the literature encompasses four major topics: evidence-based practice, characteristics of physical therapists, self-directed learning, and characteristics of the social system.

The literature was reviewed by searching various databases including ABI Inform, CINAL, ERIC, and Medline. The key words used for the search included: “evidence-based practice,” “evidence-based medicine,” “learning organization,” “physical therapy and evidence based-practice,” “organizational learning,” and “self-directed learning.”

Evidence-Based Practice

Evidence-based practice is one of the buzzwords in today’s healthcare arena. (Bury, 1998). This section provides an overview of EBP. First, EBP will be defined, second, a history of the movement as it relates to physical therapy will be presented, third, the levels of evidence will be discussed, fourth, getting evidence into practice will be addressed, fifth, the justification for EBP will be offered, sixth, illustrations from the physical therapy literature on EBP will be discussed, and finally the barriers to EBP will be described.

During the last decade, a new paradigm within healthcare and health education known as evidence-based medicine or evidence-based practice (EBP) has emerged in response to several factors. First, there has been a growing demand by third party payers to provide justification for

the number and type of treatment interventions. Second, as consumers have become more educated they have demanded rationale for treatments provided. Third, evidence has become more readily available to therapists as more and more physical therapy departments provide Internet access to therapists in their work place (Coyne, 2002).

Evidence-based practice is synonymous with evidence-based medicine and embraces the interventions of all clinicians delivering healthcare (Barnard & Wiles, 2001). The Evidence-based Medicine Working Group (1992) has described evidence-based medicine as a shift in the paradigm of the practice of medicine from clinical decisions based on intuition, unsystematic clinical experience, and pathophysiological rationale to practice based on research evidence (Kessenich et al., 1997). Many physical therapists are endorsing the need for physical therapy to move toward practice based on research evidence (Coyne, 2002).

Evidence-based Practice: What It Is. What It Is Not.

The most widely accepted definition of EBP is "The conscientious, explicit and judicious use of current best evidence in making decisions about individual patients" (Sackett et al., 1997, p. 71). The definition was expanded in 2000 to reflect the inclusion of patient values in the evidence-based process. Evidence-based practice is the integration of best research evidence with clinical expertise and patient values (Sackett et al., 2000). The authors explained the definition as follows:

- By *best research* we mean clinically relevant research, often from the basic sciences of medicine, but especially from patient-centered clinical research into the accuracy and precision of diagnostic tests (including the clinical examination), the power of prognostic markers and the efficacy and safety of therapeutic, rehabilitative, and preventive regimen. New evidence from clinical research both

> invalidates previously accepted diagnostic tests and treatments and replaces them with new ones that are more powerful, more accurate, more efficacious and safer.
>
> - By *clinical expertise* we mean the ability to use our clinical skills and past experience to rapidly identify each patient's unique health state and diagnosis, individual risks and benefits of potential interventions, and their personal values and expectations.
> - By *patient values* we mean the unique preferences, concerns and expectations each patient brings to a clinical encounter and which must be integrated into clinical decisions if they are to serve the patient. (Sackett, et al., 2000, p. 1)

The clinician uses past experience and personal interpretation to evaluate what is being said, seen, and sensed during a clinical encounter and integrates this clinical expertise with the best available evidence (Brown, 1999; Sackett et al., 1996). Best available evidence is defined by Sackett et al. (1996) as "clinically relevant research" (p. 71). The strength of the evidence will depend on the level of evidence. The highest level or gold standard for treatment intervention is the RCT or a review of several RCTs. Evidence in the literature ranges from in vitro research to the best evidence for treatment interventions for humans, which is, RCTs (Forrest, 2001). Sackett et al. (1996) posit that increased clinical expertise is reflected in more effective and efficient diagnosis and more thoughtful identification and compassionate use of the patient's account of the experience, the patient's view of the situation and the patient's expectations and preferences.

Opponents of EBP claim that it is a cookbook approach that does not take into account the individual variations from the group researched (Charlton, 1997). Sackett et al. (1996) dispute this claim by arguing that EBP requires that the best external evidence be integrated with

practitioner expertise and patient preferences. External research evidence serves to inform, but does not replace clinical expertise. The clinician uses their expertise to determine how the research applies to the patient and how the findings of the research should be integrated into the plan of care for the patient.

History of Evidence-based Practice as it Relates to Physical Therapy

Evidence-based medicine evolved from the critique by Archie Cochrane (1972), a British epidemiologist, on the effectiveness and efficiency of health services. Prior to the 1950's use of RCTs was rare, and clinical evidence generally consisted of case reports (Cochrane, 1955). Cochrane (1955) implored the Conference of Medical Officers of Health to begin investigating the prevalence of disease within communities. He identified two salient problems: "the problem that different doctors have different standards of diagnosis for the same disease" (Cochrane, 1955, p. 585) and "the problem of discovering unknown cases" (Cochrane, 1955, p. 586). More importantly, he advocated the use of RCTs.

In 1979, Cochrane drew attention to the fact that people who wanted to make evidence-based decisions about health care lacked access to reliable reviews (Mowatt, Grimshaw, Davis, Mazmanian, 2001). In response, the Cochrane Collaboration, an international organization, developed *The Cochrane Library* (www.cochranelibrarary.com).

In the 1980's the Evidence-based Medicine Working Group coined the phrase Evidence-Based Medicine (Evidence-Based Medicine Working Group, 1992; Forrest, 2001). In 1991 the Department of Health inaugurated the Research and Development Strategy for the National Health Service in Great Britain. In the opening paragraph the Director of Research and Development set as the objective:

> …to see that R & D becomes an integral part of health care so that practitioners, managers, and other staff find it natural to rely on the results of research in their day-to-day decision-making and longer term strategic planning…Strongly held views on belief rather than sound information still exert too much influence in health care. (as cited in Bury, 1998, p. 1)

This "new" approach to practicing and teaching medicine was introduced formally in the United States in 1992. The *Journal of the American Medical Association* began publishing a series of articles entitled "Users' Guides to the Medical Literature" that identified skills necessary for evidence-based medicine (Evidence-Based Working Group, 1992; Guyatt et al., 2000; Guyatt, Sackett, & Cook, 1994; Oxman, Sackett, & Guyatt, 1993) as a way of educating the physician and diffusing evidence-based medicine into medicine.

Recognizing that the explosion of medical information was overwhelming and that clinicians had little formal training in critically appraising the literature, Slawson et al. (1994) introduced a "user-friendly" method for managing new information. Most salient was the focus this method placed on "patient oriented evidence that matters" (known as a "POEM"). The authors suggested that the clinician make critical decisions regarding whether or not to read an article based on the journal article's relevance to the patient's health in the clinician's practice. Furthermore, they began providing abstracts of articles. This greatly reduced the amount of work needed to practice evidence-based medicine and made it practical.

Further reduction in the amount of work required to answer clinical questions has been made available by the use of a handheld computer. *InfoRetriever,* a handheld software program, developed by Ebell and Barry, makes available at the point of care evidence-based information

sources. In other words, they have made available evidence-based answers to questions a physician may have during the care of patients available at bedside, in the clinic office, or at home. This markedly reduces the amount of work for the busy physician (Ebell, 1999).

Unfortunately, no software of this nature has been developed for physical therapists. Lack of products and services to decrease the workload of EBP for physical therapists, however, have not deterred the promotion of EBP by national organizations. Documented efforts to develop practice based on evidence by national organizations in Great Britain and the United States follow.

In 1994, the College of Occupational Therapists, the Chartered Society of Physiotherapy and the College of Speech and Language Therapists of Great Britain published a joint position statement recommending:

- greater involvement in research and development of groups within the three professions
- management support to recognize and value the contribution of those occupational therapists, physical therapists, and speech and language therapists involved in research, education, and training in research
- a career infrastructure in research; greater understanding of methodologies relevant to research in occupational therapy, physical therapy, and speech and language pathology
- involvement in dissemination and implementation of research (Mead & Bury, 1998).

In 2000, the American Physical Therapy Association developed and published a clinical research agenda for physical therapy. The model included 72 questions for the profession to

answer. The purpose of the agenda was to provide answers to the questions that will enable physical therapists to practice through the use of research evidence. “This evidence can be used to build the scientific base of physical therapy, and clinical practice should be enhanced” (The Clinical Research Agenda Conference Participants, 2000, p. 501).

The practice of physical therapy will be enhanced with diffusion of research evidence into practice rapidly if the research evidence is made available to physical therapists in a timely manner in an understandable form. Physicians currently have available several translation journals that interpret recent research. The most useful of these services surveys all the medical literature and supplies descriptions and validity assessments on articles that patients would care about (Rao, Robbins & Roberts, 1998). At present, there is not a cadre of physical therapists in the United States, who critically review research as it emerges and presents it in an understandable manner to practicing physical therapists. The Chartered Society of Physiotherapists publishes a quarterly summary of physical therapy research evidence. This publication, however, is not readily available to physical therapists in the United States. Therefore, implementing EBP would require each physical therapist to locate, critically evaluate, and apply information from the literature to patient problems (Kessenich et al., 1997).

The evidence-based physical therapist must be able to understand the particular patient’s circumstances, identify his/her gap in the knowledge for providing care based on the best research evidence, frame a question, find the best research evidence, and apply the findings to patient care (Guyatt et al., 2000). The movement to EBP represents an attempt to facilitate making the best evidence available to clinicians and encouraging their use of best evidence in providing care for individuals and their communities. The purpose of the evidence-based

approach in the practice of physical therapy is to close the gap between what is known and what is done (Forrest, 2001).

As a way of educating physical therapists and diffusing EBP into the profession of physical therapy *Physical Therapy* began publishing articles on how to use evidence in the practice of physical therapy and evidence-based clinical practice guidelines on selected physical therapy interventions in 2001 (Scalzitti, 2001; The Philadelphia Panel, 2001). Also, physical therapists are learning how to apply research evidence to practice and about levels of evidence at continuing education courses and by visiting websites (Cormack, 2002; Forrest, 2001). The next section will present levels of evidence and the process physical therapists use to evaluate the level of evidence.

Levels of Evidence

What constitutes evidence in EBP? The clinical question the practitioner seeks to answer will determine the types of designs and range of subject matter of the studies to be critically appraised (Brown, 1999). Scientific evidence is determined through well-designed and well-controlled research investigations. The knowledge has a high probability of truthfulness because its validity has been justified by a systematic process (Forrest, 2001).

Traditional sources of evidence for practitioners in allied health fields have been printed materials, journals, clinical guidelines, other therapists, and personal experience (Forrest, 2001). Practitioners of EBP often use the “evidence pyramid” to illustrate the levels of evidence. At the base of the pyramid is in vitro research. When an idea is crystallized, the idea is developed into a therapeutic intervention or drug, which is then tested in the laboratory first on animals and then on humans. Expert opinions and editorials are the next step on the pyramid. Next are case reports followed by case series. They are reports of a single patient utilizing a treatment intervention or

collections of reports on the treatment of individuals. The cases do not use control groups and therefore have poor internal validity. The next level on the pyramid is a case control study. In these studies patients who already have a disease are compared with people who do not. Cohort studies are the next step. They follow a large population of people with a specific condition or who have received a particular treatment intervention. The cohort is compared to another group that does not have the condition or is not receiving a treatment intervention and follows the two groups over a specific time period. However, it is important to point out that patients are not randomized into different groups. The next level is RCTs. Patients are randomly assigned to a treatment group or a control group. Methods are used to control for bias and allow for comparison of the two groups (Bury & Jeorsch-Herod, 1998; Forrest, 2001; University of North Carolina, 2002). At the top of the pyramid are systematic reviews and meta-analyses. Systematic reviews focus on a clinical topic and answer a specific question (Mowatt, Grimshaw, Davis, Mazmanian, 2001). Extensive literature searches are performed to track down all previous studies relevant to the focused question and to assess their quality. Meta-analyses take the systematic review a step further by using a statistical technique to summarize the data from more than one study. The pyramid describes the hierarchy of evidence that is available (Bury & Jeorsch-Herod, 1998; University of North Carolina, 2002). The physical therapist who is an evidence-based practitioner will use the best level of evidence available in making clinical decisions. See Figure 1 for a visual picture of the “evidence-based pyramid.”

A problem that may arise for physical therapists is the likelihood that they base their clinical decision on medical/physical therapy gossip. Because physical therapists do not have a service such as “InfoPOEMs” (http://www.infopoems.com) they may make clinical decisions or

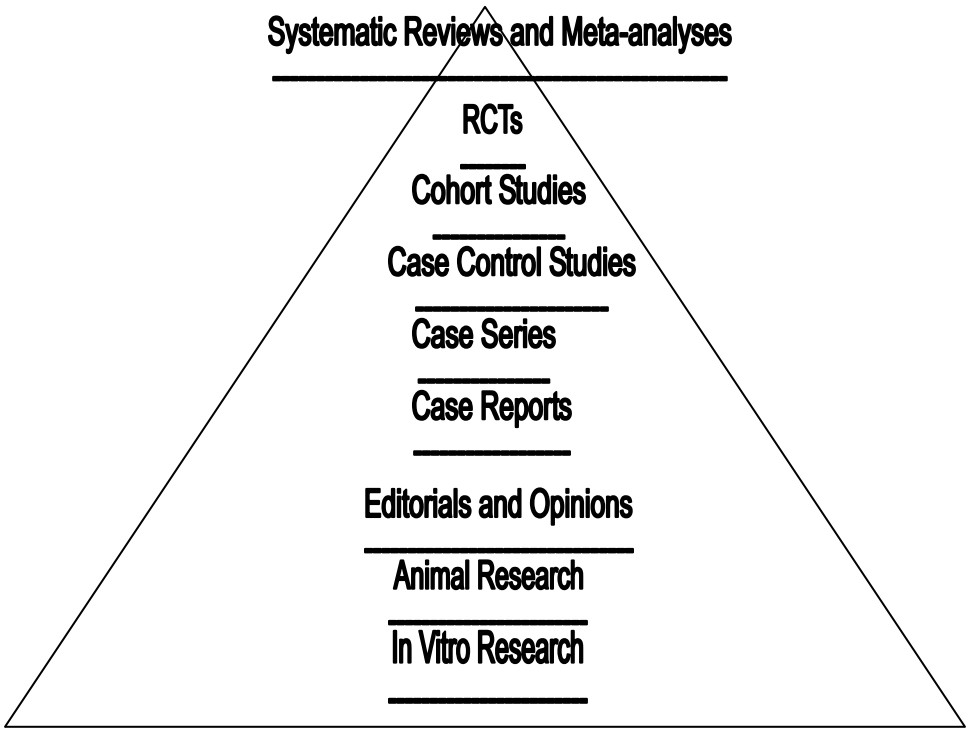

Figure 1. Levels of evidence in the "evidence-based pyramid" (Suny Downstate Medical Center, 2002).

change practice based on a single study. Slawson et al. (1994) refer to this method as "medical chatter and gossip" (p. 507). The authors remind us that researchers who evaluate articles in their area of expertise are familiar with all prior research published. An individual physical therapist may not be well versed in the area. Therefore, the authors portend that much of what is written in journals can be described as "medical chatter" to researchers with individual physical therapist listening in on selected sound bytes. Like gossip the information from one article should be considered dangerous when taken out of context. Unfortunately, not all physical therapy clinical problems have been addressed in a systematic review. When a physical therapist cannot locate a review article they will need to evaluate the validity of primary research.

To assist therapists, Bury and Jerosch-Herold (1998) have codified a checklist for determining the validity of primary research: (1) the research addressed a clearly focused issue; (2) the method was appropriate for the question; (3) the sampling strategy was appropriate and clearly explained; (4) the participants who entered the study were properly accounted for at the conclusion of the study; (5) the literature review was comprehensive and up-to-date; (6) ethical issues were addressed; (7) measures were taken to reduce bias; (8) in quantitative studies a control group was used for comparison; (8) the method of data collection was adequately described; (9) the methods of data analysis were clearly described and justified; and (10) the methods related to the original research question.

Rao et al. (1998) and the reviewers of "InfoPOEMs" (http://www.infopoems.com/validity.cfm) evaluate studies using far more rigorous criteria. For example, studies of treatments must be controlled trials and the subjects must be randomly assigned, the article must ask and answer a question about evidence that matters to patients, the study must be valid and relevant, and the results must have the potential to change the clinician's practice (Ebell, 1999).

Bury and Jerosch-Herold (1999) also have codified a checklist for physical therapists to assist them with critical appraisal of systematic reviews: (1) the review addressed a clearly focused issue; (2) the studies were appropriate to the question and have a suitable study design; (3) important relevant studies were included; (4) the authors critically appraised the quality of the studies; (5) the interventions and results that have been combined were similar from study to study; and (6) the results were presented for all possible outcome measures.

Critically appraising the literature requires knowledge and skill that many physical therapists do not currently possess. Decreasing the workload may facilitate the adoption of EBP.

The next section will discuss strategies that may make it easier and less time consuming to obtain research evidence.

Getting Evidence into Practice

Teaching physical therapists to use the above-described skills is intuitively appealing. However, attaining these skills requires investment in intensive training and time-consuming application. Furthermore, Slawson et al. (1994) report busy physicians rarely employ the techniques. Guyatt et al. (2000) found that trainees in an internal medical program overwhelmingly (95%) believe that "learning the skills of evidence-based medicine" (p. 954) is not the most appropriate method of moving to EBP. They found that the residents did however, develop a respect for and the ability to track down secondary resources of preappraised resources. Recognizing that the residents' experience rang true in their own experience, Guyatt and colleagues recently have withdrawn their call that all practitioners should become fully competent in EBP. They have acknowledged the usefulness of secondary resources of preappraised resources for enabling clinicians to easily track down the best available research evidence (Greenhalgh, Hughes, Humphrey, Swinglehurst, & Martin, 2002). When secondary resources become widely available to physical therapists this may be the most effective strategy for diffusing EBP into physical therapy.

A "user-friendly" method of managing new evidence in a practical and time efficient manner for family physicians has been described by Slawson et al. (1994). They describe four ways information is typically found by physicians. The first mode is "foraging" a method of regularly reviewing the literature to keep up to date on new information. The second method is "hunting" to answer patient oriented questions as they arise. Third is "retracing" a method of reviewing previously acquired information. Fourth, is "sporting" in which the family physician

keeps up with areas of interest just because he or she finds it fun to know about that aspect of practice.

The method described by Slawson et al. (1994) makes a distinction between disease oriented evidence (DOE) and patient oriented evidence that matters (POEM). Patient oriented evidence that matters are outcomes that patients understand and care about such as mortality, functional ability, well being, satisfaction, and mental health (Slawson et al., 1994). In order to cut to the chase and make the most use of the busy clinician's time, it is suggested that the information have the following attributes: it must be relevant to everyday practice; it must be credible; it must require minimal effort to obtain; and it must be easily understood (Curley, Connelly, & Rich, 1990). Slawson et al. (1994) have suggested a method to follow. Three screens are used to determine whether or not a primary care physician should spend their time reading an article. First, is the information in the article important to the patient's health in the practice of the primary care physician and common in the primary care physician's practice? Second, is the information valid? Third, will the information from the article change the way the primary care physician practices?

An evidence based working group "InfoPOEM" (http://www.infopoems.com/validity.cfm) has markedly reduced the workload for the busy primary care physician. Using the three screens described above the "InfoPOEMs" group reviews over 90 journals per month for POEMs. The reviewers then present a structured review of the relevant articles and a validity assessment of the research (Ebell, 1999). A service of this caliber is currently not available for physical therapists. "InfoPOEM" would be useful to physical therapists interested in accessing the wider medical literature to acquire research evidence on medical issues impacting physical therapy treatments.

At this time physical therapists “still must spend a lot of time performing a literature search with the resources available” (Delito, as cited in Coyne, 2002 p. 34). However, recently the American Physical Therapy Association has developed a new *Hooked on Evidence* (www.apta.org/hookedonevidence/index.cfm) database. The database will enable physical therapists to easily and quickly evaluate possible treatments. The development of the database is in its initial phase. Thirty conditions have been identified for which physical therapists are submitting summaries of clinical studies with outcome data from peer-reviewed articles to the online database. Each summary is critiqued by an expert reviewer, revised as needed, and accepted or rejected.

The second phase will analyze the strength of the evidence, determine the generalizablity of the evidence, and determine the treatment effect. In the final phase a comprehensive database will be available for physical therapists, who are members of the American Physical Therapy Association to efficiently search for relevant evidence to support their treatment interventions (Coyne, 2002).

Pedro, a physical therapy Internet database, that is sponsored by the University of Sydney is available free of charge. This database uses the Cochrane criteria to rate evidence and has links to PubMed (Swinkels et al., 2002). The Chartered Society of Physiotherapists distributes a quarterly summary of research evidence for physical therapists to its membership. The bottom line is that for most physical therapists research evidence of treatment interventions is not readily available. A considerable amount of work and time are needed to research and appraise the most current research evidence available.

The dilemma for physical therapists is: “Do I continue to practice based on tradition?” or “Do I take the time to review all the articles on physical therapy problems researched in the last

decade?" My sense is that given the current lack of resources available to translate research into digestible bites, groups of physical therapists need to identify the most common problems in their physical therapy practice and begin to critically appraise the literature with the assistance of a statistician consultant. For example, physical therapists in an out patient orthopedic clinic might review the literature on McKenzie's extension exercises to determine if the exercises are safe for patients with risk factors for cardiovascular disease. This would mean that the physical therapists not only review the current journal articles and reviews on extension exercises, but also review the literature on blood pressure, cardiovascular responses to extension in lying, extension in standing, heart rate, low back pain, and McKenzie lumbar spine exercises (Al-Obaidi, Anthony, Dean, Al-Shuwai, 2001). The work they do in reviewing articles could then be submitted to the *Hooked on Evidence* database to be reviewed for inclusion in the database.

Justification for Evidence-based Practice in Physical Therapy

Why do physical therapists need evidence-based physical therapy? Physical therapists need to stay abreast of the best of current research findings and plan for change in knowledge throughout their careers so that they can use the best current research evidence in making decisions about examination and treatment interventions in concert with the patient's values (Forrest, 2001). Unfortunately, clinicians continue to rely on the information they were taught in school, clinical experience, or expert opinion. The longer clinicians are out of school the greater the gap in their knowledge of current best practice (Forrest, 2001; Turner & Whitfield, 1997).

The fallacy of unsystematic clinical observation from clinical experience to substantiate the effectiveness of treatment can be seen in an exchange between Dewey (2000) and Rothstein (2000). Dewey asked, "Is it sufficient to know that the stretch reflex exists, and that in applying

the treatment based on quieting this reflex, the measurable and reproducible effect of sustained often permanent muscle relaxation is achieved?" (p. 113). Dewey's example speaks for many treatment interventions used by physical therapists. Because an idea has biological plausibility and patients improve, the treatment intervention has value to the physical therapist and may be used as a treatment (Rothstein, 2000). Rothstein points out, physical therapists "…need to measure the results of treatment and not assume that because we believe something should happen, it does" (2000, p. 114). In addition physical therapists need to "…ask whether we achieved a clinical benefit. That is, have we changed something of meaning to the patient? Have we improved function?" (2000, p. 114). Furthermore, in the absence of a controlled environment the effect of the treatment intervention cannot be isolated to show efficacy and effectiveness. Research is needed to investigate the effect of physical therapy procedures preferably through clinical trials (Rothstein, 2000).

If EBP becomes a reality, the practice based on expert opinion, intuition, and unsystematic observations, will be diminished. The new way of practicing will bring about a revolution in the practice of physical therapy. The gap between espoused and actual practice will be narrowed.

Illustrating the Need for Evidence-based Practice

This section will discuss two mainstays of physical therapy: post operative care of the patient with a total hip replacement, and ultrasound. Recent literature will be addressed to demonstrate how EBP can be used to improve physical therapy. Physical therapy is an important aspect of the post operative care of patients following total hip arthroplasty (THA). Patients are routinely seen twice a day for mobility training, exercises, and patient education. Criteria for discharge to the home environment usually include the ability of the patient to demonstrate and

verbalize total hip precautions, independence in ambulating on level surfaces, and independence in the home exercise program (Freburger, 2000).

The effect of physical therapy intervention on THA has not been widely studied. Freburger (2000) examined the relationship between physical therapy utilization and outcomes of care. She conducted a regression analysis to examine the relationship between physical therapy use and outcomes based on a sample of 7,495 patients treated in United States academic health center hospitals in 1996. The results indicated that utilization of physical therapy services was directly related to lower total care cost and the probability of discharge to the home environment. This study begins to answer questions that matter to payers. Further studies are needed to determine additional factors that contribute to the variation in total cost, increased probability of discharge home, independence of patient's mobility, and post-op total hip precautions. Studies that determine the effect of physical therapy on the patient's functional mobility are needed. What really matters to patients is that they can independently and safely ambulate on level surfaces and carry out normal activities of daily living independently upon discharge home. Randomized control trials are warranted to determine such questions as "Does immediate postoperative physical therapy intervention affect the rate of recovery of function in patients following orthopedic surgery, and if so how?" "Does the coordination of exercise and surgical interventions affect patient outcomes, and if so, what is the optimal pattern of intervention?" (The Clinical Research Agenda Conference Participants, 2000, pp. 508-509). What methods of teaching under what conditions are most effective? Randomized control trials are warranted to determine the effects of preoperative teaching on functional outcomes that matter to patients. Answering these questions will improve the quality of care for patients following THA, judiciously utilize physical therapy services, and support with evidence the

effectiveness of physical therapy. Physical therapy has been part of the protocol for THA for the last thirty years. However, limited research evidence is available to support the patterns of delivery of care or the effectiveness of particular physical therapy treatment interventions.

Ultrasound has been used by physical therapists for 60 years for treating people with pain, musculoskeletal injuries, and soft tissue lesions. The effectiveness of ultrasound for treating these problems remains questionable. Robertson and Baker (2001) identified thirty-five English language RCTs trials evaluating the effectiveness of ultrasound between 1975 and 1999. The application of exclusion criteria and methodological filters were applied to each of the studies. Ten of the studies met the criteria for inclusion in the review. Eight of the studies demonstrated that ultrasound was no more effective than the placebo. Two studies demonstrated that ultrasound was superior to placebo ultrasound. Because important details of the dosage in the two studies were omitted no generalizations can be drawn. Consequently, there is minimal evidence to support the use of ultrasound in treatment of muscloskeltal injuries or for promoting soft tissue healing.

Limitations in the review deserve note. The studies deemed to have adequate methods examined a wide range of patient problems. The dosages used in the studies varied without explanation. Also, the filter of identifying how the control group was assigned was not rigorously applied. The authors recommended identifying anecdotally clinical problems for which ultrasound has been demonstrated to be effective. Next, they recommended establishing experimental and treatment protocols for ensuring the output of all ultrasound equipment used. Given these research methods, sufficient studies should be carried out for meta-reviews to be possible. These studies may identify the extent to which ultrasound affects clinical outcomes and under which conditions (Robertson & Baker, 2001).

This review of ultrasound highlights the lack of high quality evidence currently available. The valuing of EBP by the profession and the development of physical therapy scholars who provide high quality research will lead to elimination of physical therapy practices that have no therapeutic effect on patient problems and support for interventions that have been demonstrated to be effective. The same hope that the clinical research agenda participants published for the completion of the first Clinical Research Agenda holds true for how EBP will improve physical therapy practice. “There is hope that the completion of this first Clinical Research Agenda will culminate in a radical change in the profession: the full metamorphosis of the physical therapist into a scientific practitioner” (The Clinical Research Agenda Conference Participant, 2000, p. 511).

Barriers to Adoption

This radical transformation faces many barriers by individuals and the organizations in which they practice. Based on my experience and conversation with peers I believe one of the greatest barriers to the adoption of EBP is the mental model out of which the individual physical therapist operates. There is deference to authority, whether physician or physical therapist, who offer an expert opinion and “ know best.” Studies in the United Kingdom (Bury, 1998; Closs & Lewin, 1998) suggest myriad barriers to adoption of EBP in physical therapy.

Closs and Lewin (1998) surveyed dieticians, occupational therapists, physical therapists, and speech and language therapists regarding barriers to research utilization. Individuals reported they did not see the value of research for practice and therapists felt the benefit on practice would be minimal. The therapists were unaware of research and the results were not believed to generally applicable to the therapists’ setting. Therapists also felt there was insufficient time to

implement ideas and read research. In addition, the respondents reported a lack of understanding of research methods and statistics and a lack of critical appraisal skills.

Bury (1998) has identified barriers to research that may affect the adoption of EBP into physical therapy. The barriers are:

- Time and effort
- Inappropriate infrastructure to support this approach to decision-making
- Gaps in evidence, not enough high quality evidence
- Available evidence is out of date or even wrong
- Lack of skills: critical appraisal, literature searching, use of information technology
- Perceived threat
- Lack of understanding of the change process
- Economic constraints
- Relevant information available, but not easily accessible
- Information overload (p. 23).

The impact of barriers on the adoption was a cornerstone of the framework developed by Cervero (1985). He emphasized the influence of the characteristics of the social system on the adoption of continuing education by an individual. Cervero (1985) suggested that unless there were incentives or (at least not disincentives) in the work environment for a proposed change learned in a continuing education course, the new practice was unlikely to be adopted. The same is true regarding the adoption of EBP. Squire and Cullen's study (2001) postulated that at the organizational level there needs to be a culture of learning that encourages the practitioners to

challenge current practices and empowers them to seek evidence of the reliability and validity of examination and treatment interventions.

Closs and Lewin (1998) found that barriers to research use occur at many levels within the organization. Problems were associated with the adequacy of library resources, time available for reading, presentation of the research, absence of supportive peers and supervisors, cooperation from other professions, and the absence of a positive research culture within the organization.

In summary, this section has defined evidence-based practice, outlined a history of EBP as it relates to physical therapy, described the levels of evidence, discussed getting evidence into practice, justified the need for EBP in physical therapy, illustrated the need for EBP using two long standing interventions, and described the barriers to EBP.

There is a paucity of empirical information to support the diffusion of EBP into physical therapy in the United States. The review of the literature suggests that the adoption of EBP by physical therapists is still in the early stages in the United States. Little is known about the factors that affect an individual's adoption of EBP.

The infrastructure's impact on adoption has been reviewed. As described in the studies by Bury (1998) and Closs and Lewin (1998) perception of organizational support for EBP may affect the propensity to adopt EBP. The characteristics of the individual physical therapist may also affect the extent of adoption of EBP. The next section will discuss the individual characteristics of the physical therapist that may impact adoption.

Characteristics of Physical Therapists

We have little to no empirical evidence about how physical therapists practice physical therapy, that is, how they engage in clinical decision making and what beliefs and related

behaviors they demonstrate during their work with patients and families. Reviewing research on expert physical therapists may assist with an understanding of how physical therapists learn, think, and perform in clinical practice (Jensen, Gwyer, Shepard, & Hack, 2000). Furthermore, understanding how physical therapy experts gather, sort, and apply information may help understand their propensity to adopt EBP.

Jensen et al. (2000) studied 12 peer-designated experts across four clinical specialty areas of physical therapy: geriatrics, neurology, orthopedics, and pediatrics. Using multiple case study reports, the researchers generated grounded theory on expert practice. Four dimensions of expert practice in physical therapy were identified: movement, virtues, clinical reasoning, and knowledge.

Movement and Virtues

Movement and virtues are important characteristics of physical therapists, but are not the focus of the study. A brief description of the two dimensions follows.

In clinical practice, expert physical therapists demonstrate persistent skillful movement. Skillful movement involves examination of a patient by palpation and touch. Through touch and palpation the expert physical therapists were able to assess the patient's level of function. Patients were treated with the physical therapist's hands. Use of equipment was very limited. The movement skills seem to be well rehearsed and an almost unconscious part of their practice.

Virtues in the study referred to the personal character traits and personal attributes the researchers observed in the expert physical therapists they studied. The expert physical therapists all set high standards for themselves and were committed to staying current in their specialty area. They had a strong desire to succeed and continue learning. The experts reported they were intellectually challenged by the patient's problems, had the patient's best interest in mind, and

sought to solve the patient's problem(s). The expert physical therapists communicated a sense of caring and commitment to the patients. The expert physical therapists were advocates for their patients and demonstrated this through spending time to get what was best for the patient through phone calls, letter writing, and/or serving the local and professional communities in policy areas (Jensen et al., 2000).

Clinical Reasoning

Clinical reasoning was seen as a collaboration between the patient and the physical therapist. The expert physical therapists used the patient as a source of knowledge for the assessment process. After the problem had been identified the expert physical therapists engaged the patient and family in a cooperative effort to problem solve regarding interventions (Jensen et al., 2000).

The description of the expert physical therapists' use of knowledge derived from both self and practice in making clinical decisions without reference to knowledge derived from research is troubling. The results do not reflect embracement of the value of EBP in the physical therapists day-to-day decision making (Bartlett, 2000). The absence of the valuing of EBP by physical therapists in the United States was supported by the research of Connolly, Lupinnaci, and Bush (2001). The researchers conducted a longitudinal study of physical therapy students in which they measured attitudes of students immediately preceding a research methods course, following the research methods course, after a second research methods course, and after one year of physical therapy practice. One of the attitudes measured was the appropriate source of authority for treatment decisions. The researchers found that the students modified their beliefs about appropriate sources of authority (EBP or traditional protocols) but did not sustain the beliefs once they were involved in the practice of physical therapy. After one year of practice

students ranked higher the statement that clinical practice should be based on traditional protocols, rather than the statement that clinical practice should be based on scientific studies. The findings suggest that there are elements within the clinical environment and/or characteristics of the individual therapist that do not support the embodiment of the valuing of EBP. Connolly et al. (2001) speculated that the new graduates may not see EBP applied in the clinical setting. I further speculate the environment in the clinical setting may not value uncertainty and questioning. Barnard and Wiles (2001), in a survey of attitudes of physical therapists in Great Britain regarding EBP, found that the senior physical therapists in the study were satisfied with current practice, did not value research evidence, and were fearful of it. In summary, the current profile of expert physical therapists and studies of attitudes of physical therapists regarding EBP suggests that EBP is not valued in the day-to-day practice of physical therapy.

Knowledge

Knowledge is an underpinning in the practice of physical therapy. Higgs and Titchen (1995) have described three types of knowledge in physical therapy: propositional (derived from research), craft knowledge or clinical knowledge (derived from practice), and personal (derived from self).

According to Jensen et al. (2000), peer-designated experts in physical therapy demonstrated a deep understanding of their clinical specialty area that was derived from a multidimensional knowledge base and was patient centered. The experts reported that professional education provided them with rudimentary knowledge for practice, but it was not enough. Sources of obtaining knowledge were library research, mentors, knowledge gained from

patients, and thinking and reflecting on practice. This group of experts demonstrated a knowledge base that is derived from research, clinical experience, and personal knowledge.

The physical therapy experts studied appeared to have the characteristics of adult learners as described by Knowles (1973). First, Knowles made the assumption that the adult learner had a need to be self-directed. This was exemplified in the study by Jensen et al. (2000) by the expert's lack of satisfaction with the basic knowledge taught in professional school. The expert physical therapists were highly motivated to continue to learn and sought knowledge from library research and mentors. Knowles (1973) second assumption was that an adult learner possesses an accumulation of experience that they use as a resource for their learning. The experts reported that one of the richest resources of knowledge was thinking and reflecting on their practice. The third assumption Knowles (1973) made was that adult learners were motivated to learn when the activity was related directly to their role(s) and/or life task(s). The experts reported seeking mentors to help understand and sort out complex cases. Finally, Knowles (1973) assumed that the adult learner had a problem-centered orientation toward learning. Recall that one of the most important sources of the expert physical therapists knowledge was their patients.

Anecdotally, I know that not all physical therapists possess the characteristics of adult learners as demonstrated by the expert physical therapists and described by Knowles (1973). Empirical description of physical therapists' readiness for self-directed learning has been described by Linares (1999), who administered the *Self-directed Learning Readiness Scale* (Guglielmino, 1977) to nursing students (n=489), nursing faculty (n=30), and allied health students (n=120) of which 31 were physical therapy students. An equal number of physical therapy students in Linares (1999) sample (n=12) had average and high scores (38.7 percent) on

the *Self-directed Learning Readiness Scale.* Twenty two and six tenths percent of the physical therapy students (n=7) had low scores on the *Self-directed Learning Readiness Scale*.

Self-directed learning has been generally viewed as intentional learning where the individual's goal is to gain and retain clearly defined knowledge (Linares, 1999). In EBP the physical therapist seeks to intentionally learn what is the best examination and treatment intervention for a patient based on the best available research evidence and values of the patient (Sackett et al., 2000). Measuring readiness for self-directed learning will help understand physical therapists' propensity to adopt EBP. A full discussion of self-directed leaning will be discussed in the self-directed learning section. The section will review definitions, models, and critiques of self-directed learning.

Self-directed Learning

Given the accelerating pace of change in our society the threat of human obsolescence pounds at our door. Obsolescence has a particularly strong impact on the professions–especially the health professions. The half-life of what was learned in school is increasing at the speed of light (Knowles, 1985). Sackett et al. (2000), attribute the acceleration of medical knowledge in the last decade to the maturation of biomedical research and the tremendous investment in health care research. Effective methods of learning are essential to keep health professionals from becoming obsolete. Self-directed learning has been seen as providing significant benefit to health professionals, most notably an opportunity to resolve a patient problem generally within the clinical setting (Richards, 1986). Self-directed learning has long been an ideal of medicine. William Osler stated that:

> The most hurtful thing the practitioner can do is to fail to realize, first, the need for lifelong progressive personal training and secondly, the danger lest in the

> stress of practice, he [*sic*] sacrifice that most precious of all possessions his [*sic*] mental independence. (Osler, 1906 as cited in Richards, 1986, p. 2)

Since 1906, the importance of the professional taking responsibility for his or her learning has been advocated. Many of the contemporary definitions hark back to life-long learning advocated by Osler (1906).

What is self-directed learning? In order to answer this question this section will address salient definitions of self-directed learning, models of self-directed learning, determinants of self-directed learning, and the relation of self-directed learning to physical therapy.

Definitions

The definitions of self-directed learning fall into several camps. Self-directed learning has been defined as a process, a set of personal characteristics, a process and a set of personal characteristics, a critical thinking process, and learning that is influenced by the environment.

The definitions of self-directed learning will be evaluated for their relevance to EBP and solving a problem using the EBP method known as PICO. This is the method that is currently taught to physical therapists in continuing education courses on integrating research evidence into practice. PICO is an acronym that identifies the process. P=Problem I=Intervention C=Comparison O=Outcome (PICO). PICO involves asking a question and conducting an effective search strategy. The strategy starts with a specific problem (P) from practice that the physical therapist formulates into an answerable question. Next the physical therapist identifies the main intervention (I) under consideration. Then the physical therapist considers the alternatives to the intervention for comparison (C). Finally, the physical therapist considers the Outcome (O). To answer the PICO question, the physical therapist will need to perform a systematic search of the literature and critically appraise the literature or use an information

master such as *Best Evidence*, *Inforetriever*, *Bandolier*, the *Journal of Family Practice POEMS Newsletter*, or the *Physiotherapy Effectiveness Bulletin*, that provide a critical appraisal and "bottom line summary" for the consumer (Cormack, 2002; Ebell, 1999; Forrest, 2001; Foster et al., 2001). The PICO method harks back to the natural teaching method of William Osler. He held that "the student begins with the patient, continues with the patient, and ends his studies with the patient, using books and lectures as a tool…." (Osler as cited in Manning & DeBakey, 1992, p. 1135).

A Process

> The most common definition of self-directed learning describes a process:
>
> "Self-directed learning" describes a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies and evaluating learning outcomes. (Knowles, 1975, p. 18)

Knowles' (1975) definition identifies behaviors that will be necessary for a physical therapist to engage in EBP. Specifically, the physical therapist's question is like a goal or objective. In order to answer the question, the physical therapist needs to identify the appropriate resources and compare the interventions based on the best research evidence. A limitation of the definition is the suggestion that the physical therapist would use human resources and teachers to answer problems, which is practicing based on expert opinion. EBP is a shift away from expert opinion to interventions based on the best available research evidence.

In defining self-directed learning or learning episodes Tough (1979) specifies that the episodes are intentional and directed at gaining certain "knowledge and skill" (p. 9) that will be retained. Knowledge and skill are described below.

> The term *knowledge and skill* includes any positive or desired changes or improvement in a person's knowledge, understanding, awareness, comprehension, beliefs, ability to apply, ability to analyze and synthesize, ability to evaluate, judgment, perceptual skills, physical skills, competence or performance, response tendencies, habits, attitudes, emotional reactions, recall, sensitivity, insight, confidence, patience, and self-control, and/or some personality characteristic, inner behavior or overt behavior. (Tough, 1979, p. 9)

Tough's (1979) definition adds to the salience of self-directed learning in the propensity to adopt EBP. Deciding to employ the PICO process is intentional. Identification of a problem is intentional and directed toward gaining information about the level of evidence in order to provide the most effective assessments and interventions.

Based on the concept that self-directed learning is a process, numerous authors have attempted to identify skills and abilities needed by the individual to participate in the process (Oddi, 1984). Some of the characteristics appear to be essential for performance of EBP and the PICO process.

A Set of Characteristics

Knowles (1975) identified competencies of the self-directed learner that can be seen to influence the definition of Candy (1991), Garrison (1997), Grow (1991), Guglielmino (1977), and Skager (1984). According to Knowles, the competencies of the self-directed learner consisted of: (1) understanding the learning strategies of teacher directed versus self-directed

learning, (2) a self-concept of self as an independent self-directed learner, (3) the ability to collaborate with peers to facilitate learning, (4) the ability to realistically diagnose learning needs, (5) the ability to translate learning needs into objectives, (6) the initiative to seek out and use teachers as a resource to answer learning problems, (7) the ability to identify appropriate resources to answer learning needs, (8) the ability to efficiently and effectively select and utilize learning strategies, and (9) the ability to assess the achievement of the learning objectives.

Guglielmino (1977) surveyed fourteen experts of self-directed learning in 1977 and developed the following definition of self-directed learning:

> A highly self-directed learner is one who exhibits initiative, independence, and persistence in learning; one who accepts responsibility for his or her own learning and views problems as challenges, not obstacles; one who is capable of self-discipline and has a high degree of curiosity; one who has a strong desire to learn or change an is self-confident; one who is able to use basic study skills, organize his or her time and set and appropriate pace for learning, and to develop a plan for completing work; one who enjoys learning and has a tendency to be goal oriented. (Guglielmino, 1977, p. 70-71)

Skager (1984) defined seven characteristics of a self-directed learner based on a survey of a number of theorists and researchers including Berlyne, Biggs, Dave, Joyce and Weil, March, Maslow, Rogers, Skager and Dave, and Wrocynski. The characteristics were: (1) self-acceptance, (2) planfulness, (3) intrinsic motivation, (4) internalized evaluation, (5) openness to experience, (6) flexibility, and (7) autonomy.

Guglielmino (1977) and Skager (1984) like Knowles (1975) identified skills in planning to be necessary in the self-directed learning process. To perform the PICO process one needs to

plan how he or she will locate the research evidence on the interventions to address the patient problem. For example, a physical therapist wants to answer the following question. What is the most effective method of mobilization following total knee replacement after discharge from the hospital? The physical therapist would need to plan how to locate the answer. Can the information be located on the *Evidence-based Medicine* CD or will he/she need to search one of the databases such as PEDro (http:ptwww.cchs.usyd.edu.au/pedro/-13k) or *The Cochrane Library* (www.cochranelibrarary.com) for abstracts. Then the physical therapist will need to plan how to locate the systematic reviews and journal articles.

The self-directed learner as a personality trait was described by Oddi (1984). She distinguished between self-directed learning and self-directed continuing learning. Oddi defined the former as, "a process which involves planning, conducting and evaluating ones own learning" (p. 6). Self-directed continuing learning, the term she used in conducting her study was defined as:

> A psychological construct comprised of three dimensions, each arranged on a continuum having two poles: (a) Commitment to learning versus Apathy or Aversion to Learning, (b) Cognitive Openness versus Defensiveness, and (c) Proactive Drive versus Reactive Drive. This construct is differentiated from self-directed learning as traditionally encountered in the literature because it focuses on the personality characteristics which impel an individual to continue learning over time through various means, not on the ability to engage in self-directed instruction. (pp. 6-7)

Candy (1991) reviewed the literature to codify the desired or possessed characteristics of the self-directed learner. He surveyed over twenty authors' works including: Caffarella, Chickering, Della-Dora and Blanchard, Flanagan, Ford, Gibbons and Phillips, Guglielmino,

Jankovic, Kasworm, Knowles, Maras, Maragarones, Mezirow, Miller, Moore, Strong, Torrance and Mourad, Tough, Tremblay and Danis, and Wedemeyer. According to the various studies the ideal self-directed learned would:

- Be methodical and disciplined
- Be logical and analytical
- Be reflective and self aware
- Demonstrate curiosity; openness and motivation
- Be flexible
- Be interdependent and interpersonally competent
- Be persistent and responsible
- Be venturesome and creative
- Show confidence and have a positive self concept
- Be independent and self-sufficient
- Have developed information-seeking and retrieval skills
- Have knowledge about, and skill at, learning generally
- Develop and use defensible criteria for evaluating learning. (Candy, 1991, p. 130)

The most current characteristics of a self-directed learner are listed on Brockett's web page: "experience, perseverance, curiosity, creativity, self-confidence, integrity, industriousness, self-discipline, single-minded, pursuit, ingenuity, independence, and ambition" (Brockett, 2002).

Self-discipline was identified by Candy (1991) and Brockett (2002). Without self-discipline the physical therapist may lapse into providing care based on what was learned in school or what seemed to be effective based on experience. Self-discipline is needed to develop

questions and seek out answers to the question based on the best available research evidence using the PICO process.

Grow (1991) described the highest stage of the self-directed learner as being able and willing to take responsibility for their learning, direction, and productivity. They demonstrate skills in time management, project management, goal setting, self-evaluation, peer critique, information gathering, and use of educational resources. The PICO process takes time therefore, the self-directed EBP physical therapist will demonstrate skills in time management. The physical therapist who self-evaluates will continuously ask, " Based on the best available research evidence, is this the best intervention for this patient?" In order to compare interventions based on the best available research evidence the physical therapist will need skills in information gathering and use of educational resources.

Garrison (1997) defined self-directed learning as "An approach where learners are motivated to assume personal responsibility and collaborative control of the cognitive (self-monitoring) and contextual (self-management) process in constructing and confirming meaningful and worthwhile learning outcomes" (p. 18).

Similar to Brockett and Hiemstra (1991), Garrison (1997), Grow (1991), Guglielmino (1977), and Knowles (1975), Fisher et al. (2001) saw accepting responsibility as a key element of the self-directed learner. They defined self-directed learning as follows.

> The amount of responsibility the learner accepts for his or her own learning. The self-directed learner takes control and accepts the freedom to learn what they view as important for themselves. The degree of control the learner is willing to take over their own learning will depend on their attitude, abilities and personality characteristics (Fisher et al., 2001, p. 516).

Accepting personal responsibility was seen by a number of authors as a defining characteristic of self-directed learning. Likewise it seems necessary for the performance of the EBP process. Brockett and Hiemstra (1991), Fisher et al. (2001), Garrison (1997), Grow (1991), Guglielmino (1977), and Knowles (1975) emphasized personal responsibility. In the EBP process it is the personal responsibility of the physical therapist to identify the best current research evidence and in consultation with the patient's values and the physical therapist's clinical experience make a clinical decisions (Sackett, et al., 2000).

Autonomy received emphasis as a necessary skill for the self-directed learner from various authors. Grow (1991) reported that self-directed learners thrive in an environment that fosters autonomy. Candy (1991) also saw the self-directed learner as autonomous. He posits that an alternative approach to describing a self-directed learner is to describe someone who is autonomous and ask what he or she would look like as a learner. Salient characteristics of the autonomous person are:

- Taking initiative, with or without the help of others, in diagnosing or assessing one's own learning needs.
- Selecting appropriate resources of help…
- Developing, through a process of inquiry and reflection an appreciation for the criteria by which to evaluate the particular domain of learning being undertaken.
- Asking what is the justification for rules, procedures, principles, and assumptions…
- Refusing agreement or compliance with what others (such as a teacher or trainer) state or demand where this seems to be critically unacceptable.

- Being aware of alternative choices, both as to learning strategies and to interpretations or value positions being expressed, and making reasoned choices about the route to follow in accordance with personally significant ideas and purposes…
- Continually reviewing the process of learning…
- Conceiving of goals, policies, and plans independently of pressure from others to do so or not do so...
- Developing an understanding of phenomena in such a way, and to such an extent, as to be able to explain the phenomena to others in words and under circumstances substantially unlike those terms first encountered...
- Independently forming opinions and clarifying beliefs, yet being willing to relinquish such beliefs or to alter opinions when relevant contrary evidence is presented…
- Being able to pursue a learning goal with equal vigor and determination without being adversely affected by external factors, including the increase or decrease of rewards for pursuing or obtaining the goal…
- Determining what is really of personal value or in one's interests…
- Being willing and able to accept alternative points of view as legitimate…
- Demonstrating a sober and realistic appraisal of one's shortcomings and limitations, tempered by cautious but positive awareness, based on past experience, of one's strengths, abilities, and motivations as a learner. (Candy, 1991, pp. 134-135)

Caffarella's review of the literature (1993) supported autonomy as a central component of self-directed learning. In addition, she reported that numerous scholars believe autonomy must be combined with interdependence and interconnectedness.

Autonomy, as described by Candy (1991), is consistent with the behaviors necessary to implement EBP and the PICO process. Inquiry and reflection, which are subsumed under autonomy are useful behaviors for developing the PICO question. Without initiative the physical therapist may not begin the PICO process by questioning clinical practice. Such as asking, "Is this the best treatment based on the best current research evidence?" Instead the physical therapist may continue to make clinical decisions based on past clinical experience, what he or she learned in school, or by emulating an expert physical therapist, who had good results with a treatment intervention. The most salient characteristic of autonomy as it relates to EBP is "refusing compliance with what others…state or demand…" (Candy, 1991, p. 134). Good practice for many physical therapists has consisted of following dogmas transmitted in professional education, continuing education courses, and textbooks of dubious scientific merit (Rothstein, 2000). The physical therapist that practices EBP will necessarily need to be willing to make clinical decisions differently from other physical therapists. "Being able to pursue a learning goal with equal vigor and determination without being adversely affected by external factors" (Candy, 1991, p. 134) is a key element in adopting EBP and using the PICO process. Productivity demands and inadequate infrastructure, such as no Internet access at the workstation, could thwart a physical therapist's efforts to seek evidence for interventions. Another characteristic of autonomy as described by Candy (1991) that is important in adopting the EBP process is "independently forming opinions and clarifying beliefs, yet being willing to relinquish such beliefs or to alter opinions when relevant contrary evidence is presented…"(p.

134). Physical therapists that practice EBP operate in an open system willing to change practice after he or she critically appraises the latest research evidence.

A Process and Set of Personal Characteristics.

McCune (1988) synthesized the definitions of Guglielmino (1978), Oddi (1984), and Skager (1984) to define self-directed learning for her research. Her definition was "a set of skills, abilities, attitudes, or personality characteristics that facilitate deliberate, planned involvement in self-initiated learning activities" (p. 6).

McCune's definition synthesizes existing definitions and builds on previous definitions. The definition is holistic in that it includes skills that can be acquired as well as abilities, attitudes, or personality characteristics that are stable traits in an individual. Similar to the definition by Fisher et al. (2001), McCune's definition describes multiple factors (abilities, attitudes, or personality characteristics) that would make it easier for a physical therapist to carry out the PICO process.

In a three-part definition of self-directed learning Brocket and Hiemstra (1991) include process, characteristics, and the individual. First, "It is a process that centers on the activities of planning, implementing, and evaluating learning" (p. 28). Second, "…learner self-direction refers to characteristics of an individual learner that predisposes one toward taking primary responsibility for learning endeavors" (p. 29). Third, …the individual learner is central to the idea of self-direction (p. 32). Brockett and Heimstra (1991), like McCune (1988), recognized that self-directed learning is influenced by knowledge of a process and individual characteristics that impel the learner to be self-directed.

A Critical Process

The salience of critical thinking was expounded on by Brookfield (1985) and Garrison (1997). Brookfield (1985) proposed that self-directed learning was more concerned with internal change than external management of instructional activities.

> When the techniques of self-directed learning are allied with the adult's quest for critical reflection and the creation of personal meaning after due consideration of a full range of alternative value frameworks and action possibilities, then the most complete form of self-direction is exemplified (p.15).

In describing the fully developed self-directed learner Garrison stated: "A learner who is fully self-directed has moved beyond simple task control and has learned to think critically and construct meaning in ill defined and complex content areas" (Garrison, 1997, p. 21).

Critical thinking is essential in the EBP and the PICO process. Clinical decisions are made after the physical therapist has critically evaluated the assessments and/or interventions based on the best available research evidence.

Context

The effect of the context was made explicit in the definitions of Spear and Mocker (1984). Spear & Mocker (1984) posited that the circumstances of a person's life space have an organizing function on the person's learning behavior and that behavior must be understood within the existing context. They postulated "self-directed learners, rather than preplanning their learning projects, tend to select a course from limited alternatives which occur fortuitously within their environment, and which structures their learning project" (Spear & Mocker, p. 4). Using the PICO process assumes that the resources such as a computer and Internet access are available. If textbooks or the *Guide to Physical*

Therapy Practice are at the workstation and computer access requires a trip to the library, only the highly self-directed learner will pursue a learning goal with equal vigor and determination without being adversely affected by external factors (Candy, 1991).

Brockett & Heimstra (1991) also included the importance of social context on self-directed learning. “However, such learning cannot be divorced from the social context in which they occur” (Brockett & Heimstra 1991, p. 32).

Mezirow (1981) emphasized the importance of understanding the self-directed learner “as one who is aware of the constraints on his [*sic*] efforts to learn, including the reified power relationships embedded in institutionalized ideologies which influence one’s habits of perception, thought and behavior as one attempts to learn” (p. 21). Physical therapy has a belief system that physical therapy practice should be guided by clinical experience, intuition, and the opinion of experts (Duncan, 1996). The physical therapist, who is a self-directed learner and has an awareness of the power that resides in the senior physical therapists’ “know how” based on experience rather than research evidence may be better able to sustain his/her efforts to adopt EBP.

The social context has been identified as a factor in self-directed learning by Brockett and Heimstra (1991), Meizrow (1981), and Spear and Mocker (1984). These definitions add support for the influence of the social setting on behavior whether it is using self-direction in learning or adopting an innovation such as EBP. In order for physical therapists to carry out the PICO process, they will need resources such as computers and Internet access. EBP will be fostered in a climate that supports critical inquiry and a research culture.

The multiple definitions cited in the literature point to the lack of a unified body of knowledge in self-directed learning. In developing a definition for self-directed learning for this

study the impact of each feature on the PICO process will be considered. See Table 1 for a summary of some of the definitions of self-directed learning.

Synthesis of Definitions

When presented with a patient problem, physical therapists using EBP seek information to help them collaborate with their patients to make the right treatment choices. The process involves developing an answerable question, selecting an information source to answer the question, and comparing the interventions based on the best current research evidence. Based on the patient's values, the physical therapist's clinical expertise, and the research evidence, a treatment choice is made for the patient (Bury, 1998; Forrest, 2001). The process in which the physical therapist engages will necessarily involve self-directed learning.

The process begins when the physical therapist demonstrates initiative (Knowles, 1975; Guglielmino, 1977), self-discipline (Candy, 1991; Guglielmino, 1977), and openness and motivation (Candy, 1991) by developing an answerable question. The question is similar to formulating a goal as described by Knowles (1975). The physical therapist then takes personal responsibility (Brockett & Hiemstra, 1991; Garrison, 1997; Grow, 1991; Guglielmino, 1977) for intentional learning (Tough, 1979). The intentional learning process will require knowledge and skill at learning in general, information seeking, and retrieval skills (Candy, 1991). The process will require that the physical therapist organize their time, set an appropriate pace for learning, and develop a plan for completing the learning experience (Guglielmino, 1977). Once the research evidence has been located, the skill of critical reflection must be engaged to determine the best treatment intervention based on the best available research evidence (Brookfield, 1985; Garrison 1997). The learning that occurs has the potential to change the physical therapist's practice. To carry out this process the physical therapist must pursue the

Table 1

Some Definitions of Self-directed Learning

Researcher	Date	Definition	Salient Features
Knowles	1975	…a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating goals, identifying human and material resources for learning, choosing and implementing the appropriate learning strategies and evaluating learning outcomes (p. 18).	A process
Tough	1979	"Intentional episodes of learning that are directed at gaining certain "knowledge and skill" that will be retained" (p. 9).	A process
Oddi	1984	"A process which involves planning, conducting, and evaluating ones own learning" (p. 6).	A process
Guglielmino	1977	A highly self-directed learner is one who exhibits initiative, independence, and persistence in learning; one who accepts responsibility for his or her own learning and views problems as challenges not obstacles, one who is capable of self-discipline and has a high degree of curiosity; one who has a strong desire to learn or change and is self-confident; one who is able to use basic study skills, organize his or her time and set an appropriate pace for learning, and to develop a plan for completing work; one who enjoys learning and has a tendency to be goal oriented (p. 70-71).	A set of personal characteristics
Oddi on self-directed continuing learning	1984	"A psychological construct comprised of three dimensions, each arranged on a continuum having two poles: (a) Commitment to Learning versus Apathy or Aversion to Learning, (b) Cognitive Openness versus Defensiveness, and (c) Proactive Drive versus Reactive Drive" (p. 6-7).	A set of personal characteristics
Skager	1984	Self-acceptance, planfulness, intrinsic motivation, internalized evaluation, openness to experience, flexibility, and autonomy.	A set of personal characteristics
Candy	1991	• Be methodical and disciplined • Be logical and analytical • Be reflective and self aware • Demonstrate curiosity; openness and motivation • Be flexible • Be interdependent and interpersonally competent • Be persistent and responsible • Be venturesome and creative • Show confidence and have a positive self-concept • Be independent and self-sufficient • Have developed information-seeking and retrieval skills • Have knowledge about, and skill at, learning generally • Develop and use defensible criteria for evaluating learning (p. 130).	A set of personal characteristics
Grow	1991	The highest stage of the self-directed learner is one in which the self-directed learner is "able and willing to take responsibility for their learning, direction and productivity" (p. 134).	A set of personal characteristics
Garrison	1997	An approach where learners are motivated to assume personal responsibility and collaborative control of the cognitive (self-monitoring) and contextual (self-management) process in constructing and confirming meaningful and worthwhile learning outcomes" (p. 18).	A set of personal Characteristics
Fisher, King, and Tague	2001	The amount of responsibility the learner accepts for his or her own learning. The self-directed learner takes control and accepts the freedom to learn what they view as important for themselves. The degree of control the learner is willing to take over their own learning will depend on their attitude, abilities and personality characteristics (p. 516).	A set of personal characteristics
Brockett	2002	"Experience, perseverance, curiosity, creativity, self-confidence, integrity, industriousness, self-discipline, single-minded pursuit, ingenuity, independence, and ambition" (Brockett, 2002).	A set of personal characteristics

Table 1 (continued)

S*ome Definitions of Self-directed Learning*

Researcher	Date	Definition	Salient Features
Brookfield	1985	When techniques of self-directed learning are allied with the adult's quest for critical reflection and the creation of personal meaning after due consideration of a full range of alternative value frameworks and action possibilities, then the most complete form of self-direction is exemplified (p. 15).	Critical reflection
Mezirow	1981	"… one who is aware of the constraints on his efforts to learn, including the reified power relationships embedded in institutionalized ideologies which influence one's habits of perception, thought and behavior as one attempts to learn" (p. 21).	Critical awareness
Garrison on a fully self-directed learner	1997	"A learner who is fully self-directed has moved beyond simple task control and has learned to think critically and construct meaning in ill defined and complex content areas" (p. 21).	Critical reflection
McCune	1988	"A set of skills, abilities, attitudes, or personality characteristics that facilitate deliberate, planned involvement in self-initiated learning activities" (p. 6).	A process and A set of personal characteristics
Brockett & Hiemstra	1991	"It is a process that centers on the activities of planning, implementing and evaluating learning"(p. 28). "…learner self-direction refers to characteristics of an individual learner that predisposes one toward taking primary responsibility for learning endeavors" (p. 29). "…the individual learner is central to the idea of self-direction. However, such learning cannot be divorced from the social context in which they occur" (p. 32).	A process and A set of personal Characteristic and Influenced by the environment
Spear & Mocker	1984	"Self-directed learners, rather than preplanning their learning projects, tend to select a course from limited alternatives which occur fortuitously within their environment, and which structures their learning project" (p. 4).	Influenced by the environment

learning goal with vigor and determination without being adversely affected by external factors such as lack of resources or productivity demands (Candy, 1991). Many of the self-directed learning behaviors needed for the process parallel the behaviors identified by Candy (1991) in a description of an autonomous person, namely, taking initiative, conceiving of goals and plans independently, independently forming opinions, and being willing to accept alternative views.

Definition of Self-directed Learning for the Study

The following definition was used in this research.

The amount of responsibility the learner accepts for his or her own learning. The self-directed learner takes control and accepts the freedom to learn what they view as important for themselves. The degree of control the learner is willing to take over their

own learning will depend on their attitude, abilities and personality characteristics. (Fisher et al., 2001 p. 516)

This definition includes the elements that are necessary to carry out the PICO process. The physical therapist will need to take responsibility for developing a question and locating the resources to answer the question. The self-directed learner takes control and accepts the freedom to learn what is important to themselves and the patient. This means the self-directed learner locates information about the best research evidence on possible interventions, and compares the level of evidence for the interventions so that he or she has the knowledge to integrate the best research evidence with clinical expertise and patient values (Sackett et al., 2000).

Another way to understand self-directed learning is to review some of the models that have been proposed. Models incorporate the multiple factors that affect self-direction in learning. The next section will discuss the models of self-directed learning.

Models of Self-Directed Learning

Self-directed learning has most often been seen as a process in which the learner assumes control over the learning process (Brockett & Heimstra, 1991; Knowles 1975; Tough, 1979). Knowles (1975) states that there are a variety of methods for designing a plan for learning. The classic method is the scientific inquiry model:

1. What is the question I want to answer?
2. What are the data I need to answer this question?
3. What are the most appropriate and feasible sources for these data?
4. What are the most efficient and effective means I can use to collect these data from these sources?

5. How shall I organize and analyze these data to get an answer to my question?
6. How will I report my data and test its validity? (Knowles, 1975, p. 25).

The scientific method is closely related to the PICO model that physical therapists have been taught to use to carry out EBP. The elements closely parallel one another.

Knowles (1975) suggested the ideal method of fostering self-directed learning was through a learning contract. Using a learning plan or learning contract, the self-directed learner plans his/her learning experience using four components.

1. The objectives, or a description of what the learner expects to be able to do as an outcome of the experience.
2. The learning strategies, or a description of the activities and resources necessary to prepare the learner to accomplish the stated objectives.
3. The evidence of the accomplishment, or a description of the information to be collected to measure the extent to which the objective has been met.
4. The criteria and means of validation, or a description of the persons, standards and procedures that will be used to judge the evidence. (Knowles, 1985, p. 64)

The contract suggested by Knowles may be useful for fostering self-directed learning and EBP in the early stages of its adoption. Furthermore, the template may establish a pattern that assists the physical therapist in carrying out the PICO process. The contract process would be too time consuming to expect a physical therapist to carry out with each problem encountered. The template is a useful guide for a physical therapist to use in pursing information about the question the physical therapist has developed. Managers of physical therapy clinics, who are seeking to foster adoption of EBP may want to begin the process by providing training in self-directed learning.

Tough (1979) described four phases the learner may utilize as part of the decision making process. The phases included "(1) the learner's planning, deciding, and arranging steps; (2) the learner's decisions, tasks, and arrangements; (3) the steps in the learner's decision-making process; and (4) the learners' program planning steps" (p. 63). This linear process does not add to Knowles model. The absence of a phase for critically evaluating the findings limits the usefulness of this model for use in the EBP process.

Drawing from his theory of perspective transformation Meizrow (1981) codified a charter for andragogy that would facilitate development of adults as self-directed learners. To do this it must:

1. progressively decrease the learner's dependency on the educator;
2. help the learner understand how to use learning resources–especially the experience of others, including the educator, and how to engage others in reciprocal learning relationships;
3. assist the learners to define his/her learning needs–both in terms of immediate awareness and of understanding the cultural and psychological assumptions influencing his/her perception of needs;
4. assist learners to assume increasing responsibility for defining their learning objectives, planning their own program and evaluating their own progress;
5. organize what is to be learned in relationship to his/her current personal problems, concerns and levels of understanding;
6. foster decision making–select learner-relevant learning experiences which require choosing, expand the learner's range of options, facilitate taking the perspective of others who have alternative ways of understanding;

7. encourage the use of criteria for judging which are increasingly inclusive and differentiating in awareness, self-reflexive and integrative of experience;
8. foster a self-corrective reflexive approach to learning–to typifying and labeling, to perspective taking and choosing, and to habits of learning and learning relationships;
9. facilitate problem posing and problem solving, including problems associated with implementation of individual and collective action; recognition of relationship between personal problems and public issues;
10. reinforce the concept of the learner as a learner and doer by providing for progressive mastery; a supportive climate with feedback to encourage provisional efforts to change and to take risks; avoidance of competitive judgment of performance; appropriate use of support groups;
11. emphasize experiential, participative and projective instructional methods; appropriate use of modeling and learning contracts;
12. make the moral distinction between helping the learner understand his/her full range of choices and how to improve the quality of choosing vs. encouraging the learner to make a specific choice. (Meizrow, 1981, pp. 21-22)

Meizrow's model incorporates key elements that are necessary for carrying out the EBP. The most salient features are taking responsibility for learning objectives that are centered on problems and encouraging the use of criteria for judging. When applied to the PICO process the self-directed physical therapist reflects on practice to identify problems. Then he or she organizes what is to be learned about possible treatment intervention. After locating the information the physical therapist will use established criteria to appraise research evidence.

Kasworm (1983) held that self-directed learning is an evolutionary series of developmental actions that incorporates qualitative and quantitative differences in knowledge, value, skill, and belief as measured by the level of ego development, moral and ethical development, and intellectual development. She identified several principles that can provide a basic framework about the nature and levels of the process of human cognitive and affective development as it relates to learning.

1. These levels imply qualitative differences in the individual's mode of thinking about him/herself in the personal world. Level is a concept used to aid us in conceptualizing the nature of this qualitative system and its relevance to complexity of information processing regarding how an individual learns about his/herself and the world.
2. These levels describe a complex process which incorporates the learner's unique characteristics of (a) level of skill/behavior for engagement in inquiry; (b) cognitive capacities and competencies; (c) affective and value orientations focused upon both the nature of the learning inquiry and perceptual meaning of knowledge embedded in value perspectives.
3. These levels represent different cognitive structures, behavioral capacities, and intellectual and value functions. However, in formative development, these stages present an invariant sequence, one stage must logically follow another in the formative development process.
4. Each level represents the individual's perceptual and cognitive structure of thought. Thus each stage will self-define the notion of person and self and will influence the perceptual filters with which the self views and interprets the world and nature of learning.

5. Levels are hierarchical integrations, proceedings from the less complex to the more complex. Each stage is necessary to the total process of development and has both positive and negative potentials. Each stage incorporates the earlier, less complex levels and provides the awareness to preview those stages that will come after this stage. (p. 33)

The model suggested by Kasworm (1983) could explain the lack of manifestation of self-directed learning in the clinical setting by some physical therapists. The physical therapist who has not reached the level of expert as discussed in Jensen et al. (2000) may be so involved in transferring the knowledge they learned in school to the clinical setting that they are not developmentally ready for self-directed learning and may be slow to adopt EBP.

Spear and Mocker (1984) performed a qualitative analysis of 78 self-directed learners with less than a high school education. Based on their findings they formulated four generalizations about how and why learners chose resources: (1) A change in the physical, social, and/or psychological environment in which the individual lives and functions acts as a triggering event for beginning a learning project. (2) The changed circumstances will provide a limited number or opportunities and resources for learning that are reasonable and have drawing power for the learner. (3) The circumstances will usually dictate the structure, methods, resources, and conditions for learning. (4) Learning sequences do not necessarily develop in a linear process, but are embedded in a project are the organizing circumstances for the next project.

This model adds to the study the importance of a change in the environment as a triggering event for a learning project. Physical therapy departments are being asked to provide proof of effectiveness of treatments in order to obtain reimbursement for services. Heretofore,

effectiveness was considered self-evident. Research will be necessary to substantiate proof of effectiveness. The steps that follow the triggering event according to Spear and Mocker (1984) may not apply to physical therapists. This model was developed based on learners with less than a high school education. The entry-level physical therapist has a master's level or doctor of physical therapy education, therefore this study may not be generalizable to physical therapists. Master's level or doctoral level educational programs should produce physical therapists that can and will take the responsibility to research treatments for research evidence of effectiveness regardless of the resources available in the environment.

Danis (1992) proposed a comprehensive framework of self-regulated learning processes to guide self-directed learning research efforts. Processes were defined as "the various possible interactions of a series of interdependent components which lead to the acquisition and/or application of new knowledge" (p. 48). The framework consisted of strategies, phases, learning content, learner, and context. She proposed that the strategies had an impact on the other four components and the other components likewise had an effect on the strategies.

This framework is consistent with the model of adoption proposed by Cervero (1985) in which he proposed the personal characteristics of the learner and the social context will affect the adoption of an innovation. The characteristics of the individual learner and the characteristics of the social context may affect the physical therapist's use of self-directed learning and propensity to adopt EBP.

Cavalier (1992) described the vivid example of independent self-directed learning of the Wright brothers as a classic learning adventure. They began with a goal, circumstances and context impacted their learning, they made decisions along the way, they met seemingly insurmountable obstacles, the circumstances and context gave them feedback and they as

collective learners remained persistent. The adventure was characterized by five distinct stages: (1) inquiry, (2) modeling, (3) experimenting and practicing, (4) theorizing and perfecting, and (5) actualizing.

This model could be applicable to EBP. The learner sets a goal (the problem). The physical therapist may encounter seemingly insurmountable problems i.e. lack of time, productivity demands. The physical therapist will make decisions along the way as he/she gains more information about the efficacy of treatment interventions and collaborates with the patient.

Brockett and Hiemstra's (1991) model, the *Personal Responsibility Orientation* model, marries the external concepts of the instructional process and the internal characteristics of the learner. In the instructional process the learner takes the primary responsibility for planning, implementing, and evaluating the learning experience. The internal characteristics of the learner refer to the individual accepting responsibility for the learning experience. The authors equate personal responsibility for learning with autonomy. Assuming responsibility for learning is the cornerstone of the *Personal Responsibility Orientation* model. However, Brocket and Hiemstra (1991) emphasize that the individual is only the point of departure in understanding self-directed learning. The social milieu in which the learning takes place will have a marked impact on the learning.

This model of self-directed learning correlates closely to the framework that is the backbone of this study. The individual characteristics of the learner and the social context markedly affect the outcome. Understanding the relationship of these two variables in relation to the propensity to adopt EBP is important to understanding the adoption of EBP.

Garrison (1997) describes a comprehensive model of self-directed learning. The model integrates the cognitive, motivational, and social dimensions of self-directed learning. Garrison's

model begins with self-management, which is synonymous with the traditional emphasis of self-directed learning and includes task-management and external control in the social context in which the learning takes place. This aspect is intended to reflect the learner's management of resources and implementation of the learning process. Self-monitoring is taking responsibility for integrating new knowledge with previous knowledge, constructing meaning through critical reflection and collaborative confirmation, and ensuring that learning goals are being met. The final piece, motivation, includes entering motivation and task motivation. In other words, what motivates the learner to participate in the learning experience and persists in the learning experience until the goals are achieved.

Garrison's (1997) model like Brockett and Heimstra's (1991) model incorporates the social context and emphasizes the learner taking responsibility. Particular emphasis is placed on integrating new knowledge with existing knowledge. This is essential to make a critical judgment about the best treatment intervention based on the best available research evidence. This model also adds constructing meaning through critical reflection. In EBP this would mean given the best available research evidence the physical therapist integrates this information with clinical expertise and the patient's values to make a clinical decision.

Grow (1991) proposed a staged approach to self-directed learning based on Hershey and Blanchard's *Situational Leadership Model.* He suggested that there are four stages of learners: Stage 1- Learners of low self-direction; Stage 2- Learners of moderate self-direction; Stage 3- Learners of intermediate self-direction; and Stage 4- Learners of high self-direction. Teacher's were also categorized according to their teaching style: Teacher 1- Authority, expert; Teacher 2- Salesperson, motivator; Teacher 3- Facilitator; Teacher 4-Delegator.

Grow posits that there are severe problems when the dependent learner is matched with the delegator. Grow discusses the range of problems that may occur with a mismatch. He suggests that teaching should be "matched to learners with the explicit purpose of helping them attain the knowledge, skills motivation and goal of becoming more autonomous in learning and (I add somewhat idealistically) in life" (Grow, 1991, p.142). To encourage harmony and a working relationship Grow describes the student's needs and suggest implications for teaching based on the learner's stage.

The usefulness of Grow's model for this study is identification that there is a range of self-direction among learners. The learner who rates low on self-direction may not have the initiative or take the responsibility to develop an answerable question. Furthermore, the individual may not have the self-direction necessary to carry out a plan that will enable a comparison of interventions for the best level of research evidence.

Fox and Bennett (1998) developed a model of self-directed learning for continuing education and change in physicians that included three systems: the self-directed curriculum, learning in groups, and learning in the organization. The self directed curriculum consisted of three stages.

- Stage 1- learning is directed toward understanding and estimating personal levels of need to learn in order to adopt a change in practice
- Stage 2-energies are applied to learning the new competencies needed to practice differently
- Stage 3-learning is organized around the problems of using new skills, altering the practice environment, or adapting the new way of practice to increase the goodness of fit. (p. 467)

This model, which builds on Meizrow's andragogy charter, will prove useful for implementing the process of EBP in physical therapy. By first identifying the needs of the learner, the models recognizes the differences in needs that may be present among master's level graduates and baccalaureate graduates in research and critical appraisal skills necessary to carry out the PICO process. Next, physical therapists learn the new skill by identifying questions that arise in their practice when making clinical decisions. They practice the new skill by carrying out the PICO process for the clinical question they have asked.

The models proposed by Knowles (1975) and Tough (1979) were linear in nature and suggest that with instruction the learner should be able to carry out a project using self-directed learning. Mezirow (1981) adds to the instructional process of goal setting, planning, implementing, and evaluating a learning experience by "assisting the learner to assume increasing responsibility" (p. 21). Brockett and Hiemstra's (1991) and Garrison's (1997) models include the need for the learner to take personal responsibility in the self-directed learning process. The influence of the social milieu was included in many of the models (Brockett & Hiemstra, 1991; Danis, 1992; Fox & Bennett, 1998; Mezirow, 1981; Spear & Mocker, 1984). Some saw the social milieu as interacting with the process and learner to influence implementing self-directed learning (Brockett & Hiemstra, 199l; Danis, 1992; Fox & Bennett, 1998; Garrison 1997; Spear & Mocker 1984). Kasworm (1983) suggests that the learner's ability to participate in self-directed learning depends on the stage of ego development. Brockett and Hiemstra's (1991) model and Garrison's (1997) model incorporates the need to take personal responsibility and the social context. These two models are consistent with the theoretical framework for this study, which considers the impact of the characteristics of the individual learner and the social context on the propensity to adopt EBP.

Determinants of Self-directed Learning: Theories and Empirical Support

Multiple streams have emerged as possible determinants of self-directed learning. Self-directed leaning is seen as a process that can be learned (Knowles 1975; Tough, 1979), a learning style (Bonham, 1989), a developmental stage (Kasworm, 1983; Kegan, 1980, 1982, 1994; Kegan & Lahey, 2000), a continuum from novice to expert (Daley, 1999), and a result of the environment (Spear & Mocker, 1984). This section will examine the most salient works in the areas hypothesized to influence self-directed learning and relate them to this study.

Theory

Self-directed learning was described by Knowles (1975) as in tune with our natural psychological development. He saw learning as "a basic human competence-the ability to learn on one's own"(p. 17). He based his assumptions on the body of theory and practice, known as andragogy. Knowles (1975) defined andragogy as the art and science of helping adults learn. His assumptions were: the learner was an increasingly self-directed organism, the learner's experience was a rich resource for learning, the learner's readiness to learn developed from life's experience, the learner's orientation to learning was problem centered, and the learner was seen as motivated by internal incentives and curiosity (Knowles, 1975). Based on his assumptions Knowles posited that self-directed learning can be facilitated.

Several limitations to the theory are of note. Knowles does not provide an explanation for why the learner is increasingly self-directed. This theory may not be true of all racial, cultural, educational, or gender groups that comprise the population of physical therapists.

Bonham (1989) theorized that self-directed learning was a learning style. She proposed three styles in addition to the nonlearner: other-directed, self-directed in the instructional mode, and self-directed in the inquiry mode. She established a model within the educational setting and

outside the educational setting. The nonlearner is usually not present in the educational setting. Outside the educational setting this individual does not seek learning opportunities and does not view learning as a way to solve problems. This person is satisfied with what he or she learned in school and would potentially provide the same intervention without regard to research evidence. The other directed learner prefers to have the teacher direct the learning activities. Outside the educational setting they would rely on textbooks, videos, or the guidance of other clinicians for direction in learning to resolve a problem. The physical therapist with this learning style would potentially seek additional information when encountering a problem, but the resources would not be the best current research evidence since textbooks are frequently out of date before they are published. The self-directed learner in the instructional mode plans at the beginning of a learning project in the educational setting. Outside the educational setting the self-directed learner in the institutional mode uses multiple resources efficiently for solving a problem. Learning episodes are utilitarian and focused on the problem at hand. This type of learner would be an adopter of EBP despite the amount of work that is currently involved for physical therapists. The self-directed learner in the inquiry mode prefers to plan the learning while in the process of learning and may go in a direction of their own choosing in the educational setting. Outside the educational setting the individual will use multiple resources, but may choose them for their accessibility or pleasure in learning. The physical therapist with this type of self-directed learning style outside the educational setting would seek to learn more about a problem but may not find the best available evidence because of his or her inefficient style of researching the problem.

The model has not been tested to determine if it is a valid classification of self-directed learning. The theory of choice of resources outside the educational setting based on differential

sensitivity has limited evidence for the classification Bonham made. However, the model is useful to the study because the model suggests that even though someone may score high on a self-directed learning readiness scale he or she may not adopt EBP because of the inefficient style of researching.

Empirical Support

Empirical support for self-directed learning is provided by Tough (1971) in *Adult Learning Projects.* Tough (1971) reported the findings of interviews of seven groups of people engaged in seven different occupations (n=66). He found that almost everyone undertakes at least one project a year. The mean number of projects was eight and three tenths and the median was eight projects. Sixty-eight per cent of the projects were self-planned. This suggests that adults do engage in self-directed learning activities. This supports Knowles theory that adults have a need to be self-directed. Tough's findings suggest that self-directed learning will be perceived to be present among all physical therapists.

The limitations of the study are the small sample that was not randomly selected from the population. The groups studied were professors, politicians, lower-white-collar men, lower white-collar-women, factory workers, teachers, and mothers. The generalizability of the study to a profession with educational levels of bachelor degrees, master's degrees, and doctoral degrees is questionable.

Empirical support for the presence of different levels of readiness for self-directed learning among physical therapy students was cited in the section on characteristics of physical therapists. Linares (1999) findings suggested that levels of self-directed learning, high, average, and low were distributed through out the population of student physical therapists. However, the

very limited number of physical therapy students studied limits the generalizabilty of this study to the population of working physical therapists.

Empirical support for Spear and Mocker's (1984) study was cited in the section on models of self-directed learning. Spear and Mocker's (1984) study demonstrated that the physical and psychological environments were important factors in determining why and how a learner pursed a learning project. Managed care, consumers, and businesses have begun to demand proof of the effectiveness of treatment interventions provided by physical therapists. Physical therapists have responded by seeking evidence for the efficacy of their treatment interventions. The resources used to provide the information on the efficacy of their treatment interventions may have been based on what was available in their environment, which may not have been the best available current research.

Developmental stages have been suggested as determinants of self-directed learning (Kasworm 1983; Kegan 1994; Kegan & Lahey, 2000). Kegan (1994) provides theory and empirical support for the necessity of developmental stages in becoming a self-directed learner. In his seminal work, Kegan (1980) described a new theoretical framework, the constructive developmental approach, to explain our meaning making activity.

In the terminology of constructive-developmental theorist a person shifts from "a socialized to self-authoring epistemology" (Kegan & Lahey, 2000, p. 59). Kegan (1982) posits that there was an evolution of self in relation to other that is made possible by the emergence of a qualitatively new order of consciousness. In other words, the self evolved in its relation of self to others along a continuum. Each new balance between the self and other is described as a stage. In stage one, the impulsive balance, the impulses are the self. In stage two the individual takes control of their impulses and the self-concept emerges. In stage three, the interpersonal stage, the

other people in an individual's life become the means by which they complete themselves. Other people define the individual and the world. In other words, I am my relationships. Stage 4, the institutional balance, is characterized by "authority-sense of self, self-dependence, self-ownership" (Kegan, 1982, p.100). In stage 5, the interindividual balance, the self runs the organization. Empirical support for the presence of stages was reported by Kegan (1994).

Kegan (1994) reviewed 13 studies of adults (n = 282) using subject-object interviews and random sampling procedures on the order of consciousness. He found that about half the populations in the samples studied did not reach the fourth order of consciousness. Kegan (1994) suggested that if not all adults reach a level of self-authorship, not all adults will be self-directed. Asking one to be self-directed means asking one to change the whole manner in which they understand themselves, their world and the relationship between the two (Kegan & Lahey, 2000). Kegan postulates that arriving at adulthood does not automatically transform one into a self-directed learner. He believes personal authority is a prerequisite for self-directed learning. Personal authority is only gained when one goes through the painful process of altering his or her relationship to public authority.

Some physical therapists have not gone through the process of altering their relationship to public authority. Two factors affect the developmental stage of physical therapists in the clinical setting. First, physical therapy began as a certificate program that was later moved into the university as a Bachelor of Science program. Also, physical therapy has evolved from a prescription from the physician, to a referral "to evaluate and treat" a patient, to having the right to independent practice today under the laws of most states. In this hierarchal relationship with the physician in charge, because of a superior education and state law, physical therapists were often given protocols by the referring physician. Many if not most physical therapists uncritically

accepted that the protocols were based on pathophysiological research and were valid interventions to facilitate the improvement of function in patients. Combine the physical therapy history with Kegan's (1994) findings that half of the population has not reached the developmental stage of altering their relationship to public authority and it could be extrapolated that a portion of physical therapists have not reached the developmental stage to alter their relationship with physicians. Furthermore, they have not reached the developmental stage to be self-directed and do not accept responsibility for researching the protocol or any patient problem to determine the best protocol or intervention based on the best available research evidence.

Limitations of Kegan's findings include lack of reported validity and reliability studies to indicate he actually tested for fourth order consciousness. Also, the sample was not representative of a normally distributed population in America.

Daley (1999) compared ten novice nurses and ten expert nurses to analyze the different learning processes. The results of the study indicated that there was a marked difference in the learning processes of novices and experts. Novice nurses learning processes were dependent on concept formation and were impacted by fear of mistakes and a need to have their understanding of the concept validated. Novices learning strategies involved asking experts, particularly physicians, looking up the information, and taking courses. Experts on the other hand used a constructionist approach and self-directed learning. One nurse, in describing her development from novice to expert reported, "What I didn't know as a novice and what I have learned in my career, was how to teach myself–that I was capable of finding out anything I wanted to find out because I know the resources…." (Daley, 1999, p. 142). Daley (1999) suggested that experts demonstrated a self-directed learning process similar to Garrison's (1997) definition of a fully self-directed learner. "An adult learner who is fully self-directed has moved beyond simple task

control and has learned to think critically and construct meaning in ill defined and complex content areas" (p. 21).

Daley's findings suggest that novice practitioners may be too involved in applying what they learned in school to critically examine existing protocols and other interventions. Therefore, it would not be expected that they would use the PICO process to develop a question.

This section has cited theories and empirical work to support different reasons for why people do or do not utilize self-directed learning. Knowles (1975) suggested that self-directed learning is a natural developmental state in which the adult becomes increasingly self-directed and he suggested self-directed learning could be facilitated. Bonham (1989) suggests that self-directed learning is a learning style. Kegan (1994) extrapolated his findings of fourth order consciousness to suggest that half the population was not capable of self-directed learning. Daley's study (1999) suggested that among nurses self-directed learning was utilized as a strategy only among experts. Based on these studies self-directed learning does not appear to be present to an equal degree among all people.

These findings are important to this study because they lend support to the hypotheses that self-directed may not be a learning strategy used by all physical therapists. If it is known that there is a varying degree of self-directed learning among physical therapists, an instrument that demonstrates the degree of self-directed learning and the propensity to adopt evidence-based practice will be useful.

Critiques

Brookfield (1985) challenged the widely accepted claim that adults are self-directed based on the narrow sampling frame of white middle class adults used in studies prior to 1985. At the time of his critique most of the subjects selected to represent the research universe for

self-directed learning were middle class. He further pointed out that the groups surveyed were from educationally advantaged populations. In addition, he reported that conspicuously absent were cross-cultural studies of self-directed learning among African-Americans, Hispanics, Asians, or Native Americans. Therefore, he concluded that it was evident that the findings could not be generalized to the total American or Canadian population. Physical therapists are educationally advantaged, therefore, Brookfield's criticism would not apply to the study in regards to generalization. Physical therapists are racially diverse. Accordingly, in drawing conclusions about the degree of readiness for self-directed learning, race may be a confounding variable. It should not be assumed that the instrument used to survey individuals's perception of themselves is a valid measure of self-directed learning of racial groups that were not included in the sample used to establish the validity.

Caffarella and O'Donnell (1987) concurred with Brookfield that subjects who were studied in the verification studies were primarily middle class. However, they reported that evidence of self-directed learning among hard to reach subjects does exist in the literature on verification. They cited four studies, one of which dealt with just African-American participants.

Brookfield (1984) further criticized the research in self-directed learning for its commitment to measurement scales, structured interview schedules, questionnaires, and prompt sheets. He reported his success with interviewing adults of low educational attainment using organic-inductive interviewing in which subjects were asked to expand on a particular event. He described the conversation that he elicited as imbued with some thematic holistic unity in contrast to the staccato barrage of interview questions and self-completion questionnaires. He further pointed out that the quantitative research had not attended to the quality of learning. Correlating physical therapists' perception of readiness to learn with propensity to adopt EBP

will add to the literature knowledge of self-directed learning as a predictor of critical thinking regarding physical therapy interventions.

In addition, Brookfield (1984) criticized the exclusive research interest that had been placed on the individual learner. In concentrating attention on the individual learner's control over the planning, implementing, and evaluation of learning, the social setting for a great deal of self-directed learning has been ignored. Based on the Cervero (1985) model it is critical to evaluate the social context as a predictor on the propensity to adopt EBP.

Brookfield (1985) further criticized self-directed learning writers for describing it as a technique that focuses on being technically competent in setting goals, locating resources, formulating learning strategies, and developing evaluative criteria. He feels the technical self-directed learner may not be demonstrating critical reflectivity, a characteristic he feels is essential to true self-directed learning. A fully adult form of self-directed learning is evident when the techniques of self-direction are married to critical reflection on existing values, beliefs, and social forms, and a conscious attempt is made by the adults concerned to recreate aspects of their work lives, personal relationships, and socio-political structures based on the critical reflection (Brookfield, 1985).

Tennant (1992) challenged Grow's (1991) theory matching the staged approach to self-directed learning and teaching style. He noted the need for explanatory power for the theory. Furthermore, he argued the model lacked internal consistency and had not been shown to handle a wide range of observations.

Empirical support to counter Tennant's argument comes from the allied health literature. Linares (1999) study demonstrated that self-directed learning is distributed to different degrees in physical therapy students. Linare's study was only a snapshot of physical therapy students at one

point in time. Additional support for Grow's staged approach to self-directed learning could be demonstrated by a longitudinal study of self-directed learning conducted before and after instruction, activities, and interventions in self-directed learning have been administered. Tennant's challenge serves to underscore the additional research that is needed in self-directed learning. Tennant's challenge will not directly affect the findings of this study. However, without explanatory power for Grow's staged model it cannot be extrapolated that improving an individual's skills in self-directed learning will increase their propensity to adopt EBP.

Summary of Self-directed Learning

The literature review has demonstrated that self-directed learning has a broad array of definitions. A tight definition is needed for this study. Self-directed learning has been operationally defined for this study as follows.

> The amount of responsibility the learner accepts for his or her own learning. The self-directed learner takes control and accepts the freedom to learn what they view as important for themselves. The degree of control the learner is willing to take over their own learning will depend on their attitude, abilities and personality characteristics. (Fisher et al., 2001, p. 516)

The literature review has examined multiple models for self-directed learning. Brockett and Hiemstra's model (1991) was shown to be closely aligned with the theoretical framework for this study. They posit that individual characteristics of the learner and the social context markedly affect the outcome. This study looked at the relationship of these two variables in relation to the propensity to adopt EBP.

The literature review on the theory of determinants of self-directed learning indicates self-directed learning is a characteristic of the adult learner. Empirical evidence suggests self-

directed learning is present to varying degrees within the population (Daley, 1999; Kegan & Lahey, 2000; Linares, 1999). There is a paucity of studies of physical therapists to support the degree to which physical therapists demonstrate self-directed learning.

Evidence-based practice is warranted in the practice of physical therapy. Cervero (1985) suggests that the personal characteristics of the learner might influence the rate of adoption. Since physical therapists do not have a cadre of individuals to translate EBP into digestible bites, the responsibility remains with the individual physical therapist to develop questions on each clinical problem, research the problem, and critically appraise the research studies for their level of research evidence. Self-directed learning appears to be necessary to carry out these processes.

Self-directed learning is a method of learning that places the responsibility for planning, implementing, and evaluating a learning experience on the individual learner. Adopting EBP will require that an individual physical therapist plan, implement, and evaluate a learning experience about clinical problems in order to locate and critically appraise research evidence on the problem. Each clinical question that a physical therapist develops during the course of his or her clinical practice is intentional, encourages critical thinking, and may change his or her practice. Also, the working environment may affect self-directed learning and the propensity to adopt EBP. If it can be demonstrated that physical therapists, who possess the characteristics of self-directed learning demonstrate a propensity to adopt EBP, it follows that self-directed learning is a skill that should be fostered in the curriculum and facilitated by managers of departments of physical therapy.

In addition to the personal characteristics of the individual physical therapist, the propensity to adopt EBP may be influenced by the context in which the physical therapist

practices. The next section will discuss the effect of the characteristics of the social system in the workplace on the propensity to adopt EBP.

Characteristics of the Social System

The purpose of this section is threefold. The first purpose is to describe the theory of organization learning. The second purpose is to explore the key elements of a learning organization. The final purpose is to explore how each element of the learning organization has the potential to facilitate the adoption of EBP into physical therapy.

There has been growing recognition that the characteristics of the social system of the workplace affected clinician's propensity to adopt EBP. For example, a survey of therapists and nurses rating barriers to research utilization demonstrated that 81.6% of the therapists reported insufficient time on the job to implement new ideas; 68.9% reported they did not have time to read research; 65% felt the facilities were inadequate for implementation of research; 56.3 % did not feel they had enough authority to change patient procedures; 43.7% commented that doctors will not cooperate with implementation; 40.8% reported that other staff were not supportive of implementation of research; and 35% stated that their administration would not allow implementation (Closs & Lewin, 1998).

Physical therapists alone cannot change all the factors that inhibit the adoption of EBP into practice. What is needed is change at all levels of the organization (Eldrige & South, 1998; Humphris, Littlejohns, Victor, O'Halloran, & Peacock, 2000).

At all levels of the organization it is imperative to create a learning culture (Squire & Cullen, 2000) where individuals are inspired to use their innate curiosity and challenge current practice. Furthermore, all levels of the organization need to be vested with the power to search for the best research evidence and set standards using the best available research evidence

(Squire, 2001). One method that has been suggested for achieving this paradigm shift is creating a "learning organization" (Squire & Cullen, 2000, p. 1014). A learning organization is the creation of the ideal of type of organization (Easterby-Smith, 1997; Sta. Maria, 2000). The next section will discuss organizational learning.

Organizational Learning

Despite over two decades of scholarly papers on organizational learning in multiple disciplines since the publication of Argyris and Schön's (1978) seminal work on organizational learning there is no agreement on what is organizational learning (Easterby-Smith, 1997; Lipshitz & Popper, 2000). This section will review salient literature from the organizational development discipline on organizational learning.

Cummings and Worley (2001) define organizational learning as follows: "A change process that enhances an organization's capability to acquire and develop new knowledge. It is aimed at helping organizations use knowledge and information to change and improve continuously. It involves discovery, invention, production, and generalization" (p. 674). An organization is a collection of individuals that has established agreed upon ways of deciding, delegating and setting the boundaries for membership. The organization can be temporary or act on an ongoing basis (Argyris & Schön, 1996).

"What is an organization that it may learn?" (Argyris & Schön, 1996, p. 3). According to Argyris and Schön:

> Organizational learning occurs when members of the organization act as learning agents for the organization, responding to changes in the internal and external environments of the organization by detecting and correcting errors in organizational theory-in-use, and

> embedding the results of their inquiry in private images and shared maps of the organization. (Argyris & Schön, 1978, p. 29)

Beneviste (1987) confirms this distinction by differentiating between a professional goal as statements, dogmas, or implicit assumptions behind what the organization is about and an operational goal as the actual purposes pursued by an organization as seen by its actual behavior.

In today's healthcare arena, people at all levels of the organization must combine the mastery of highly specialized technical knowledge and skills with the ability to work in teams, form productive relationships with their patients and their caregivers, critically reflect on the practices of their organizations, and change the organization. An essential piece of this type of organizational learning is the learner's critical reflection on their own behavior, in which they identify ways they often contribute to the organization's problem and then change how they act (Argyris, 1991). The detection of error occurs when there is a gap between the espoused theory and the theory-in-use. Espoused theory is what an organization says they do to explain their actions. Theory-in-use is the theory that is constructed based on the actual performance (Watkins & Marsick, 1992). For instance a physical therapists may claim to use EBP, but in day-to-day practice follows traditional protocols that have not been subjected to scientific studies.

Argyris and Schön (1996) describe two levels of learning that occur in an organization when an error is detected. Single loop learning occurs when the organization reflects on the consequences of action when the actions do not match the intended outcome. Based on the learning from the situation a strategy is developed to remedy the situation. The strategy is implemented and the results evaluated, but values of the organization are unchanged.

Single loop learning may occur in physical therapy departments as insurance companies, patients, and businesses demand proof of the effectiveness of treatment interventions. Physical

therapists may seek evidence to present to insurance companies to obtain reimbursement for services, but the culture of the department remains unchanged. The image held in the mind of the physical therapist is: “We have to find proof that this intervention works so we will be paid for our services.” They may seek evidence from textbooks, the *Guide to Physical Therapy Practice*, or hire a consultant to provide proof that the interventions they are providing meet the usual standard of care (S. Platt, personal communication, July, 2002). Proof of effectiveness may be located to present to the insurance company for reimbursement. However, the mental models of the physical therapist remain unchanged. Evidence is not sought because of critical inquiry or a desire to provide the best treatment based on the best available research evidence. Unfortunately, compliance with EBP in departments that practice single loop learning will be grudgingly adhered to by physical therapists in order to meet audits and insurance companies demands.

Double loop learning comes into existence when the organization not only reflects on the consequences but also examines and modifies the theories-in-use upon which the action was taken. Double loop organizational learning has occurred when the individuals within the organization respond to the gap between espoused theory and theory-in-use. When double loop learning has occurred in the physical therapy department, the physical therapists and managers will modify their images of the organization. The organization becomes a learning culture where physical therapists are encouraged to challenge current practice (Squire, 2001). There is an acknowledgement of uncertainty about current physical therapy practices. The evidence-based physical therapist will strive to make explicit the knowledge gaps. This contrasts sharply with the traditional model of physical therapy practice in which uncertainty is seen as a failing and good physical therapists know what to do (Herbert, Sherrington, Maher, Moseley, 2001). The department restructures the activities of the department so that teams of physical therapists have

the time, knowledge, and resources to find the research evidence for the most frequently seen diagnosis. The decision to review practice is made by physical therapists in the organization because they desire to provide the best research evidence for the clinical decisions they make (Mead & Bury, 1998). There is receptiveness and a commitment to change among the physical therapists (Humphris et al., 2000). In other words, the shift to EBP and a culture of inquiry are held in the physical therapists' minds and the organizational environment (Argyris & Schön, 1996). Double loop learning will be manifest by a change in underlying norms, policies, and objectives (Argyris & Schön, 1978). The physical therapy department members will develop objectives for shifting to EBP and establish policies regarding clinical practice that comply with EBP because they value and embrace the new paradigm where practice is based on research evidence.

Argyris and Schön (1978) have suggested a model II theory-in-use to bring about double loop learning. For the organization to move toward a model II, the double loop learning must go on at both the individual and systemic level. In order for double loop learning to occur, the individual and the organization for which they are agents must become aware of what they are not able to do. Therefore, the first step is a diagnosis of where they are in relation to moving toward model II theory-in-use. "To make this possible, they will have to become aware of their individual Model I theories-in-use, the primary and secondary inhibiting loops…and the norms and games at the organizational level" (Argyris & Schön, 1978, p. 168). Model I behaviors are characterized by making nondisconfirmable statements and utilizing unilateral control of others in order to win. For example, in the study by Barnard and Wiles (2001) senior physical therapists were reported not to value research evidence and were fearful of it. When junior physical therapists attempted to introduce EBP they lacked the power to change and the support from

managers. The senior physical therapists maintained control by continuing to practice as they had for many years based on clinical practice for which they had little evidence.

Model II behaviors, on the other hand, offer an invitation to others to confront one's views in order to produce the most valid information possible, problem solve, and learn. Argyris (1991) describes this as learning how to reason productively by breaking down walls of defensiveness. One effective way of teaching individuals to reason productively is to use case studies. The case study would legitimize physical therapists talking about issues, which they were unable to discuss before. For example, when questioned about the practices the junior therapists believed were not supported by research evidence, the senior physical therapists became fearful. The research evidence can be presented in a nonthreatening manner through case studies. This could occur at the department level through a journal club and at the organizational level through grand rounds in which the research evidence for interventions from all disciplines would be presented. The shift to productive learning throughout the organization may lead to organizational learning.

Watkins and Marsick (1992) define organizational learning as a product:

> In the product model of organizational learning, the organization has learned when it has developed better systems for error detection and correction; changed the mental models of its members to a new way of doing business; changed organization memory by changing some part of how we encode memory (the management information system, the budget, policies and procedures, etc.) unlearned old ways of thinking; or has learned how to capture and encode knowledge latent in experience. (Watkins & Marsick, 1992, p. 375)

Productive learning will be manifest in an organization when the mental models of physical therapists have shifted to a climate where there is critical inquiry about all clinical practices. All physical therapists would be continuously asking, " Am I providing the best treatment intervention for this patient based on the best available research evidence?" (Mead, 1998). No longer would pseudoscientific norms dictate practice. Answers to the question "How do you know method X works?" would be based on research evidence instead of answers such as "That is what I was taught" or "Because I see it work every time I use it" (Michaels, E. as cited in Rothstein, 2000). This shift will be facilitated if physical therapy departments are scanning the environment and know that there is a shift in the paradigm from pseudoscientific physical therapy practice to physical therapy practice based on the best available research evidence.

March (1991) uses the term exploration to describe exploration of the environment. Exploration is needed to promote organizational learning and growth. Choices must be made about gaining new information about alternatives and thereby improving future returns (exploration) and using the information currently available to improve current returns (exploitation). Learning as exploration may be learning whole new procedures such as EBP or developing a new product. Learning that is exploitation would be refinement of existing products or procedures (Watkins & Marsick, 1993).

March (1991) posits that organizations hold a code of knowledge and beliefs. As individuals come into the organization they are socialized into this code by example, instruction, and indoctrination. Concomitantly, the organization code is modified by new comers' beliefs as they come into the organization. Mutual learning has implications for the tension between exploration and exploitation.

The code of knowledge held by a physical therapy department could work for or against adoption of EBP. In a study by Barnard and Wiles (2001), the culture was seen as a significant influence on the propensity to adopt EBP in a setting with a research culture and working against EBP in other cultures. Physical therapists working in hospitals associated with a university felt they were a part of the research culture "It's like being [in] a teaching hospital, so you're learning all the time and you've got the facilities to back you up. It's not such a big thing to start getting involved in research, it's kind of just assumed "(junior physical therapists as cited in Barnard & Wiles, 2001, p. 120). On the other hand, the code of knowledge was shown to work against EBP where senior staff or superintendents were resistant to change. Junior physical therapists noted difficulties in challenging senior staff about practices that they felt were not supported by the best research evidence.

> The hospital I work in is relatively small and the consultants have been there for years and the superintendents have been there for years and most of the seniors have been there for years and they sort of just go along quite nicely, and it's all worked out okay and so they are not keen to change things. (junior physical therapists, as cited in Barnard and Wiles, 2001, p. 120)

Huber (1991) examined four constructs he believed to be an integral part of organizational learning: knowledge acquisition, information distribution, information interpretation, and organizational memory. First, he examined knowledge acquisition. Congenital knowledge is the information acquired at an organization's conception and prior to its birth by the creators and is distributed to the new members. After the organization's birth, knowledge may be acquired through experiential learning that may take the form of experimental learning, vicarious learning, grafting, or searching the environment. Regarding information distribution

Huber (1991) posits that when information is widely distributed in an organization individuals and units are more likely to learn. He suggests that interpretation of new information by units throughout the organization is affected by:

> (1) the uniformity of the cognitive maps possessed by the organizational units; (2) the uniformity of framing the information as it is communicated; (3) the richness of the media used to convey the information; (4) the information load on the interpreting units; (5) the amount of unlearning that may be necessary before a new interpretation can be generated. (Huber, 1991, p. 102)

Gray (1998) has suggested an effective mechanism of uniformly framing information. He posited that the organizations in which individual clinicians practice should manage knowledge as efficiently and effectively as it manages other resources.

> Every hospital, primary care team, and community service needs to decide what knowledge comes into the organization, how that knowledge should be distributed, and what knowledge should be exported from the organization: this system of knowledge engagement requires someone to take responsibility for it– the organization's chief knowledge officer. (Gray, 1998, p. 832)

Organization memory will be influenced by "(1) membership attrition, (2) information distribution and organizational interpretation of information, (3) the norms and methods for storing information, and (4) the methods of locating and retrieving information" (Huber, 1991, p. 105).

In the practice of physical therapy, memory has sometimes been transmitted purposefully without reflection or critical inquiry. For example, patients are routinely placed on continuous passive motion units following total knee replacement for six hours on and six hours off and are

taught only exercises that are part of “Doctor X’s” protocol. Physical therapists rotate through the orthopedic post surgical floor passing on the protocol to the next therapist on the rotation. EBP physical therapy requires autonomous practitioners who are willing to challenge the existing practices and replace them with the best current research evidence. This will occur in an organization that is willing to critically reflect on its assumptions, norms, and values and concomitantly encourages continuous learning.

This brief review of the literature has reviewed salient concepts of organizational learning. Tordoff (1998) suggested the organization that fosters EBP should be a learning organization in which management and colleagues support research. Various scholars have described the learning organization. The next section will focus on more fully defining and describing the learning organization as well as linking it to the adoption of EBP.

Defining the Learning Organization

The term learning organization was popularized by Peter Senge (1990) in his seminal work *The Fifth Discipline: The Art and Practice of the Learning Organization.* Senge (1990) defined learning organizations as “Organizations where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free and where people are continually learning how to learn together” (p. 3). Many scholars have suggested a definition of the learning organization.

Watkins and Marsick (1993) defined a learning organization as:

> …one that learns continuously and transforms itself. Learning takes place in individuals, teams, the organization, and even the communities with which the organization interacts. Learning is a continuous, strategically used process-integrated with, and running parallel to, work. Learning results in changes in knowledge, beliefs, and behaviors. Learning also

> enhances organizational capacity for innovation and growth. The learning organization has embedded systems to capture and share learning. (pp. 8-9)

According to Dixon, (1994) the learning organization "…is conceptualized as a circle in which new information is used to challenge existing ideas and to develop new perspectives on the future and new action through 'organizational dialogue'" (p. 83). She described a culture that supports learning based on assumptions she holds. Learning is socially constructed and open to interpretation, which is influenced by the cultural setting in which it is embedded. The learning organization is therefore a collective construction of meaning that involves everyone, not just specialists, and is continually being altered. Problems are solved by reflection in action. In the words of Schön (1983) the problem solver continuously "surfaces, criticizes, restructures, and embodies in further action" (p. 50) problems as they occur. From this continuous reflection in action new understanding is continually developed. Dixon further assumes that learning in community facilitates organizational learning. The learning task of the learning organization is to co-create with the environment meaning and action based on that meaning. The learning organization prizes diversity of thought. Finally, the learning organization views all parts of the system as interrelated.

For Gephart, Marsick, Van Buren, and Spiro (1996):

> A learning organization is an organization that has an enhanced capacity to learn, adapt, and change. It's an organization in which learning processes are analyzed, monitored, developed, managed, and aligned with improvement and innovation goals. Its vision, strategy, leaders, values, structures, systems, processes, and practices all work to foster people's learning and development and to accelerate systems-level learning. (pp. 35, 38)

Although individuals and teams are the practitioners through whom learning occurs learning organizations focus primarily on systems level organizational learning.

Marquardt (1996), like Gephart, Marsick, Van Buren, and Spiro (1996), Senge (1990), and Watkins and Marsick (1993) is of the opinion that the learning organization should be systematically defined.

> A learning organization, systematically defined, is an organization, which learns powerfully and collectively and is continually transforming itself to better collect, manage and use knowledge for corporate success. It empowers people within and outside the company to learn as they work. Technology is utilized to optimize both learning and productivity. (Marquardt, 1996, p. 19)

More recently Garvin (2000) describes a learning organization. “A learning organization is an organization skilled at creating, acquiring, interpreting, transferring, retaining knowledge, and purposefully modifying its behavior to reflect new knowledge and insight” (p. 11).

The definition cited by Watkins and Marsick (1993) most closely parallels the dynamic nature of EBP. The practice that has adopted EBP continuously learns and changes practice as new evidence is found for examination procedures and therapeutic interventions. Learning results in changes in knowledge, beliefs, and practice. See Table 2 for a summary of definitions of the learning organization.

Characteristics of the Learning Organization

Similar to the case with the definition of the learning organization, there are many conceptions of the characteristics of the learning organization depending on the perspective of the writer. This section will review selected scholar's views of essential elements of the learning organization.

Table 2

Some Definitions of the Learning Organization

Author	Reference	Date	Definition
Garvin	*Learning in Action*	2000	"A learning organization is an organization skilled at creating, acquiring, interpreting, transferring, retaining knowledge, and purposefully modifying its behavior to reflect new knowledge and insight." (p. 11)
Gephart, Marsick, Van Buren and Spiro	*Learning Organizations Come Alive*	1996	A learning organization is an organization that has an enhanced capacity to learn, adapt, and change. It's an organization in which learning processes are analyzed, monitored, developed, managed and aligned with improvement and innovation goals. Its vision, strategy, leaders, values, structures, systems, processes, and practices all work to foster people's learning and development and to accelerate systems-level learning. (pp. 36, 38)
Marquardt	*Building the Learning Organization*	1996	A learning organization systematically defined, is an organization, which learns powerfully and collectively and is continually transforming itself to better collect, manage and use knowledge for corporate success. It empowers people within and outside the company to learn as they work. Technology is utilized to both optimize learning and productivity. (p. 19)
Dixon	*The organizational learning cycle*	1994	"…is conceptualized as a circle in which new information is used to challenge existing ideas and to develop new perspectives on the future and new action through 'organizational dialogue'"(p. 83).
Watkins and Marsick	*Sculpting the Learning Organization*	1993	The learning organization is one that learns continuously and transforms itself. Learning takes place in individuals, teams, the organization and even the communities with which the organization interacts. Learning is a continuous, strategically used process– integrated with, and running parallel to, work. Learning results in changes in knowledge, beliefs, and behaviors. Learning also enhances organizational capacity for innovation and growth. The learning organization has embedded systems to capture and share knowledge (pp. 8-9).
Senge	*The Fifth Discipline*	1990	"Organizations where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free and where people are continually learning how to learn together" (p. 3).

Senge (1990) identified the five disciplines that form the foundation of learning organizations: systems thinking, personal mastery, mental models, building a shared vision, and team learning. Systems thinking is a framework for seeing the interrelationships of the parts that form the whole. In EBP there would be an appreciation of all disciplines shifting to EBP and the impact that the shift will have on the quality of care. Personal mastery is the commitment of individuals within the learning organization to life long learning and continuously challenging and clarifying their personal mission. In EBP this means continually questioning practices and

seeking the best research evidence for clinical decision-making. Mental models are the assumptions individuals hold and comprise their worldview based on past experience. In EBP this will mean the culture of the physical therapy department and the individual physical therapist will shift from always being right and knowing what to do to a position of questioning and uncertainty followed by seeking the best available research evidence. Team learning values the insights of all people. No longer will the expert and senior physical therapists set the standards for practice. Instead the practice will be based on the best available research evidence. Similar to Marsick and Watkins (1993), Senge (1990) emphasized the practice of building a shared vision. Involving the clinicians in the decisions about the vision of best available research evidence as a standard increases the likelihood that EBP will become a theory-in-use for all physical therapists.

Like Senge (1990) and Watkins and Marsick (1993, 1996), Kline and Saunders (1993) characterized emergent learning organizations as continually sharing information, creating a culture that supports learning, aiming to liberate the intelligence of all members of the organization, and fostering dialogue. Kline and Sanders (1983) add to the characteristics of the learning organization:

- Encouraging self-directed learning at every level of the organization
- Mistakes are viewed as opportunities for continuous learning and as essential for growth of an organization
- Readiness to rework organizational systems and structures
- Learning is celebrated for the sheer joy of learning
- Learners are encouraged to structure their own learning
- Self-assessment is taught

- Recognizing and appreciating different learning styles
- Cultivating each employee's abilities and knowledge in all areas
- Learning is made logical, moral and fun.

The most salient additions by Kline and Saunders (1983) to fostering the propensity to adopt EBP are: self-assessment is taught, mistakes are viewed as opportunities for continuous learning and as essential for growth of an organization, self-directed learning is encouraged, and learning is celebrated. If a physical therapist learns to self-assess they will be continually reflecting on practice. Reflection on practice leads to asking: "Am I providing the best intervention under the optimal schedule?" The creation of uncertainty impels the therapist to seek the best available research evidence for the treatment intervention. The organization that celebrates learning and encourages self-directed learning fosters a culture that embraces EBP. Learning from mistakes requires an organization to create a culture that explores the root causes of clinical incidents. This means creating a blame-free environment to encourage reporting and a method to assess the mistake and take remedial action (Squire & Cullen, 1991).

Gephardt et al. (1996) suggest that there are six essential features of a learning organization: (1) continuous learning at the systems level, (2) knowledge generation and sharing, (3) a culture of learning, (4) critical systemic thinking, (5) a spirit of flexibility and experimentation, and (6) a people-centered orientation. Three of these features, continuous learning at the systems level, knowledge generation and sharing, and a culture of learning, parallel Kline and Sanders (1993), Senge (1990), and Watkins and Marsick (1993) imperatives for the learning organization. Critical systemic thinking will facilitate the adoption of EBP by physical therapists. Unwritten rules frequently dictate how individuals behave within an organization. Challenging or altering these rules is a key step to change. For example, take the

unwritten rule “only direct patient care is real work” (Squire, 2001 p. 1015). Challenging the assumption may lead to valuing by management time for physical therapists to research interventions for the current best available research evidence for effectiveness. A spirit of flexibility and experimentation gives staff physical therapists permission to try new things in a safe and accepting environment in order to improve the quality of patient care (Squire, 2001).

Marquardt and Reynolds (1994) performed worldwide research on global learning companies. They identified 11 characteristics as being essential to global learning companies:

- “Appropriate structures (The best structure is small and streamlined)” (p. 51).
- “Learning organizations provide a facilitative climate where learning is highly encouraged” (p. 63).
- “People are treated as adults with adult capabilities, which include: The capability to learn. The ability to decide for themselves how to solve problems. The ability to expand greatly their productive, creative and learning capacity” (p. 56).
- “There are three considerations regarding environmental interface: Scan the environment. Affect the environment. Choose the environmental target” (p. 58).
- “Everyone is a knowledge creator and worker. Knowledge should be transferred throughout the organization” (p. 60).
- “A critical key to creating a learning organization is using technologies appropriate to support such an organization” (p. 62).
- “Quality…is an absolute requirement for global business success” (p. 64).
- “…the most critical part for becoming a learning organization is a deliberate and conscious strategy” (p. 66).

- "Global learning organizations are concerned not only about organization productivity and profits, but also about the quality of their employees' working lives" (p. 67).
- "Effective learning organizations know the importance of working in teams to maximize knowledge and resources" (p. 69).
- "A shared, challenging vision is critical to success as a global learning organization" (p. 74).

Similar to Watkins and Marsick (1993), Senge (1990), and Kline and Sanders (1993), Marquardt and Reynolds (1994) emphasize a shared vision and encourage learning. Like Gephardt et al. (1996) they are people-centered. They add to the characteristics "the most critical part for becoming a learning organization is a deliberate and conscious strategy" (p. 66).

Squire (2001) has suggested that implementation of clinical governance within the National Health System of the United Kingdom will depend on creating a learning culture. No studies have been cited in the literature that specifically link EBP to learning organizations.

According to Watkins and Marsick (1993, 1996) seven complementary action imperatives are essential to the learning organization: (1) continuous learning opportunities are available, (2) inquiry and dialogue are encouraged, (3) collaboration and team learning are promoted, (4) systems to capture and share learning are put in place, (5) people are enabled to work toward a collective vision, (6) the organization is connected to its environment, and (7) leaders model and support learning at the individual, team, and organizational level. What would the action imperatives look like in an organization that is in the process of adopting EBP or has adopted EBP?

The Organization Creates Continuous Learning Opportunities

The learning organization creates continuous learning opportunities at the individual, team, and organizational level (Watkins & Marsick, 1996). Adoption of EBP will mean decision making at each level involves reviewing the best available research evidence and integrating the patient's views with clinical experience. This means that patients, managers, and physical therapists must have a knowledge base of the research evidence available (Squire, 2001). Accessing and appraising the evidence will require that a continuous learning infrastructure be in place. Some examples suggested by Marsick and Watkins (1999), include: structured education practices such as workshops at the individual level, team development workshops at the team level and benchmarking at the organizational level; informal work and learning practices like self-directed learning at the individual level, guided team reflection at the team level and after action review at the organizational level; learning rewards would be available in the form of incentives at all levels, and technology to support learning such as Internet access at the individual level, bulletin boards and list serves at the team level, and community wide bulletin boards and communication systems at the organizational level.

Continuous learning opportunities have been recognized to have a powerful effect on the use of EBP in occupational therapy (Barnitt, 1999). Humphris et al. (2000) studied the factors that influence the use of research evidence by occupational therapists in Great Britain. Sixty-six occupational therapists completed a questionnaire that included items on the availability of research and availability of resources. Research was available, but the participants had minimal time to read about the research. Fifty percent or more of the respondents reported that research was conducted in the trust, research was conducted in their clinical area, and access to research findings was available where the participants worked. However, only 11% had time to read

research findings while they were on duty to work. The availability of resources to support the use of research evidence would seem to have an effect on the research evidence in practice. The majority of respondents agreed that they had access to a library of current journals and books containing research studies and techniques (95%), a librarian with access to a CD ROM to search the literature (85%), and access to the Internet (53%). The resources necessary for EBP were available, but only a small percentage of the respondents had time to read research at work. It is not surprising that the respondents listed dedicated time in the workweek for research activities as a helpful factor in making use of research findings.

To encourage the use of EBP in occupational therapy practice, Bennett and Bennett (2000) suggested that therapists seek continuing education to develop skills for accessing information resources, understanding research methodologies, summarizing statistics, and critically appraising the literature. They also supported using evidence based resources on the Internet, participating in research on occupational therapy, participating in a journal club, using evidence-based guidelines, contributing to the development of EBP guidelines, and negotiating time at work to locate and appraise research evidence.

Barnard and Wiles (2001) explored physical therapists' views of factors that influence use of EBP. Fifty-six physical therapists from a wide range of treatment settings in Great Britain were surveyed using focus groups. Physical therapists perceived that good access to resources, education and training, proactive colleagues, a positive research culture, and environment promoted EBP.

The Organization Promotes Dialogue and Inquiry

Promoting dialogue and inquiry in the learning organization calls for open minds and open communication. It means the culture supports questioning, giving feedback, listening, and

keeping open to new viewpoints (Marsick & Watkins, 1993). Challenging the assumptions on which we operate is key to facilitating the development of a learning organization (Squire & Cullen, 2001). In a learning organization that is in the process or has adopted EBP the scenario of the junior physical therapists that was powerless to influence the senior physical therapists to change would be replaced with the TALK model.

- Tell the person with whom you wish to dialogue what you are thinking from the start. Always illustrate your inferences about the situation that you have observed that led you to your conclusion.
- Ask whether the other party holds the same conclusions.
- Listen to the other person's response…Listening in this model demands the individual go beyond repeating what was said to stating what they understood, checking to see if that was what was meant, and working to reach a joint meaning that may differ from where both parties began.
- Keep open to the other's views. For talk to be inquiry, both parties need to consider they do not have all the information they need and that their thinking may not be accurate. People in learning organizations learn to question the underlying attitudes behind their talk, because it is beliefs that drive action. (Watkins & Marsick, 1993, p. 90)

Ellinor and Gerard (1998) hold that dialogue is the key to building cultures of collaboration. When dialogue is practiced the following qualities are present: "suspension of judgment, the release of the need for specific outcomes, an inquiry into and examination of underlying assumptions, authenticity, a slower pace with silence between speakers listening deeply to self, others and for collective meaning" (Ellinor & Gerard, 1998, p. 26). In

communities of physical therapists where it is okay to question and challenge the status quo, the desire for evidence upon which to base a practitioner's treatment interventions should grow. A collegial atmosphere is essential for dialogue. Dialogue occurs when there is a conscious act of thinking of one another as colleagues in a mutual quest for insight and clarity (Senge, 1990). In the study by Barnard and Wiles (2001), the hierarchical nature of the senior physical therapists and superintendents thwarted critical reflection on the efficacy of the treatment interventions when the junior physical therapists challenged the evidence for the treatment interventions. Without a safe atmosphere for thinking and questioning learning is truncated. The quality of patient care suffers because patients are treated based on the physical therapist's past experience, intuition, what he or she learned in physical therapy school, or the current, popular, unexamined treatment interventions.

Lipshitz and Popper (2000) posit that to increase learning in the organization, learning mechanisms must be embedded in a learning culture. Essential to a learning culture are five values: (1) sharing ones thoughts in order to receive feedback, (2) persisting in a line of questioning until one has a full understanding, (3) willingness to give and receive feedback, (4) remaining issue oriented regardless of the rank of the individual, and (5) assuming responsibility for the learning and the lessons learned.

The authors compared two wards in a hospital with markedly different atmosphere and leadership style. From the study they concluded that organizational learning is rarely a single process that engages the entire organization. Rather, individual groups within the organization learn in different fashions at different levels of intensity. Within the individual groups the quality of learning depends on the interaction between group members. The group member's interactions were shown to be related to the group's transparency. The transparency of the group

depends on the extent to which the senior physicians model transparency by inviting others to participate in the discussion, encouraging individuals to comment on their reasoning, demonstrating openness to criticism and suggestions, and frankly expressing their doubts and past errors. These findings are consistent with the emphasis placed on dialogue within the learning organization by Dixon (1994), Ellinor and Gerard (1998), and Watkins and Marsick (1993).

The Organization Promotes Collaboration and Team Learning

In the learning organization "groups are expected to learn together and work together" (Marsick & Watkins, 1999, p. 50). Learning in teams in the organization that is adopting EBP will encourage health professionals to work in partnership to solve problems that matter to patients (Squire, 2001).

The Organization Establishes Systems to Capture and Share Learning

In a learning organization that had adopted EBP, high and low technology systems were engaged to capture learning. In departments where a culture of EBP was encouraged recent graduates shared their knowledge of critical appraisal skills, current best research evidence for treatment interventions, computer skills, and databases. Experienced physical therapists shared their clinical expertise and experience. The capturing and blending of knowledge were important to the development of EBP (Barnard & Wiles, 2001).

March (1991) posited that mutual learning would have implications for exploration and exploitation. As physical therapists become knowledgeable of how to carry out the EBP process, physical therapy departments may want to exploit the physical therapists' skills in researching evidence by making Internet access by computers available to each physical therapist at their

workstation. Continuous exploration will be necessary to know and utilize the current best research evidence for treatment interventions.

The Organization Empowers People Toward a Collective Vision

The learning organization has a shared vision. It depends on the participation of many if not most of the stakeholders in developing a collective vision (Watkins & Marsick, 1993). Creating and achieving this shared vision occurs by engaging staff at all levels of the organization. The importance of adopting a shared vision can be illustrated by comparing a key point of the vision statements of the clinical governance of the National Health Care System and the study by Closs and Lewin (1998). “Good practice and research evidence is systematically adopted” (Clinical Governance Support Team, 2002). If a shared vision such as the vision of the Clinical Governance Support Team were held by an organization, the findings in Closs and Lewin’s (1998) study on barriers to research utilization by dieticians, physical therapists, occupational therapists, and speech therapists would be reversed. Funding for infrastructure adequate for implementation of research would be budgeted. Authority to change patient procedures would be based on best available research evidence. Doctors would cooperate with implementation of procedures that were based on the best available research evidence. Staff and administration would be supportive of implementing research.

A study by Wilkinson, Bosanquet, Salisbury, Hasler, and Bosaquet (1999) demonstrates empirical evidence for factors that facilitate adoption of EBP by physicians in general practice in Great Britain. The factors parallel the action imperatives of the learning organization. The researchers interviewed 44 general practitioners to understand their perspectives on facilitators and barriers to the implementation of EBP and their attitudes toward the concept of EBP. Based on the interviews the researchers developed a model for barriers and facilitators to change in

prescribing habits of physicians. Having the means to change, having the motivation to change and maintaining the change were related to the following practice factors that parallel Watkins & Marsick's (1993) action imperatives: (1) shared goals, aims, and plans within the practice; (2) challenging, constructively critical attitude within the practice; (3) teamwork; and (4) effective computer systems (Wilkinson et al., 1999).

The Organization Connects the Organization to its Environment

In the learning organization that is thinking globally "people scan the environment and use information to adjust work practices" (Marsick & Watkins, 1999, p. 50). Evidence-based practitioners identify questions from problems presented by patients. They scan the environment by searching the literature for the best available research evidence on the problem. Furthermore, they evaluate their patient outcomes against the standard benchmarks that have been established.

The Organization Provides Strategic Leadership for Learning

Organizations have a new challenge in the age of EBP to make the workplace safe for thinking and problem solving. This involves creating space and support for learning through the design of the infrastructure (Bierema, 1999). She posits a learning infrastructure should incorporate a learning culture, new leaders, critical thinking, and visioning. She further suggests, an important step in creating an environment that supports learning is developing an infrastructure where the structure, policies, and processes as described by Watkins and Marsik (1993) and Senge (1990) are implemented. Builders of learning organizations must develop the infrastructure so that people have the resources they need: time, management support, information, ready contact with colleagues, and technology (Senge, Kleiner, Roberts, Ross, & Smith, 1994).

The new view of leadership in the learning organization is characterized as a designer, steward, and teacher. The new leaders are responsible for breathing life into the learning organization by building organizations where there is clarity of vision. The new leaders encourage people to continually expand their abilities and work toward improving shared mental models (Senge, 1990).

The new leader is a designer. The designer builds a shared vision of the direction of the organization (Senge, 1990). The designer creates the infrastructure that will support the learning process (Bierema, 1999).

The people cannot step out and change the way things are done unless they are supported from the top. Leaders must provide a safe place in which people can take on new behaviors and realize that it is expected that they challenge the status quo. The ideal situation is one in which leaders themselves model learning (Marsick & Watkins, 1999, p. 159).

The new leader is a steward. According to Senge (1990) the new leader becomes a steward of the vision. In fostering the adoption of EBP the leader becomes the steward of "…the integration of best research evidence with clinical expertise and patient values" (Sackett et al., 2000). The new leader will be a role model and share stories for the organization to live by in the organization (Bierema, 1999).

The new leader is a teacher. The teacher fosters learning for everyone (Senge, 1990). "The leader as teacher is not about teaching, but rather about designing the learning process whereby people throughout the organization can deal productively with the issues they face, and develop their mastery in the learning disciplines" (Bierema, 1999, p. 52).

Empirical Support for the DLOQ

The seven complementary action imperatives of the learning organization formed the basis for the development of the DLOQ (Watkins & Marsick, 1993; 1996). This section provides evidence of the DLOQ as a useful tool for measuring the learning organization.

Selden (1998) surveyed family run businesses (n = 2,966) to determine the relationship between the seven dimensions of the learning organization and knowledge performance and financial performance. Selden (1998) found that six of the seven dimensions of the learning organization were significantly correlated with knowledge performance. Promoting inquiry and dialogue was not significantly correlated. All seven of the dimensions were significantly correlated with financial performance.

McHargue (1999) surveyed nonprofit organizations (n = 617) to determine the relationship between the dimensions of the learning organization and knowledge performance, financial performance, and mission performance. All seven dimensions of the learning organization were significantly correlated with financial performance, knowledge performance and mission performance.

The DLOQ has been used to show that the presence of characteristics of a learning organization in the workplace influenced the adoption of an innovation in Malaysia (Sta. Maria, 2000). Sta. Maria (2000) used the 1996 version of the DLOQ to survey 11 Malaysian public sector organizations that had been using a new system for at least a year. One of the author's research questions dealt with the extent to which the respondent's perception of a learning culture, as measured by the dimensions of the learning organization, explained the use of the innovation. The findings demonstrated that as a whole the dimensions of the learning organization explained 31.5% of the variance. Sta. Maria's findings lend support for the

usefulness of the DLOQ as a predictor in this study of the extent the propensity to adopt EBP can be explained by the characteristics of the social system in the workplace.

Summary of Organizational Learning

To achieve adoption of EBP there is a need to create a learning culture (Squire & Cullen, 2001). “Organizational learning is a change process that enhances an organization’s capability to acquire and develop new knowledge” (Cummings & Worley, 2001 p. 674). When an organization shifts the way it thinks and acts, it can be said to have put into practice the espoused theory. A learning organization is the creation of an ideal type of organization where espoused theory and theory-in-use occur concomitantly (Easterby-Smith, 1997; Sta. Maria, 2000).

The ideal learning organization according to Watkins and Marsick (1993, 1996) has seven complementary action imperatives that are essential: continuous learning opportunities are available, inquiry and dialogue are encouraged, collaboration and team learning are promoted, systems to capture and share learning are put in place, people are enabled to work toward a collective vision, the organization is connected to its environment, and leaders model and support learning at the individual, team, and organizational level. Builders of learning organizations must develop the infrastructure so that people have the resources they need: time, management support, information, ready contact with colleagues and technology (Senge et al., 1994).

Organizations, departments of rehabilitation managers, and physical therapists have a responsibility to create spaces that are safe for critical inquiry and learning. Bierema (1999) has identified the importance of creating an infrastructure where the structures, policies, and processes support learning. The adoption of EBP was demonstrated to be facilitated by

infrastructures that supported continuous learning, dialogue and inquiry, and teamwork (Wilkinson et al., 1991).

Summary of Literature Review

The western world of healthcare is undergoing a paradigm shift from clinical practice based on tradition, expert opinion, intuition, unsystematatic clinical observation, and pathophysiologic rationale to practice that is based on research evidence (Duncan, 1997;Evidence-Based Working Group, 1992; Kessenich et al., 1997). The new paradigm, evidence-based practice, is defined as "the integration of best research evidence with clinical expertise and patient values" (Sackett et al., 2000, p. 1). The literature review has demonstrated that providing evidence of the effectiveness of physical therapy interventions is warranted.

Information about EBP has been diffused to physical therapists primarily by editorials and opinion papers by leaders in the profession and journal articles on how to implement EBP in the day-to-day practice of physical therapy. Concomitantly insurance companies are demanding proof of the effectiveness of physical therapy treatment interventions in order to provide reimbursement.

At this time the responsibility remains with the individual physical therapist to develop questions on each clinical problem, research the problem, and critically appraise the research studies for the level of research evidence. The physical therapist then combines the evidence with clinical expertise and patient values in managing individual patients and achieving optimal outcomes (Sackett et al., 2000; Scalzitti, 2001). Unlike physicians there are no services available to reduce the workload.

The literature review demonstrated that despite these less than optimal circumstances physical therapists are willing to adopt EBP. Studies in Great Britain have shown that physical

therapists believe EBP is important to the development of the profession (Barnard & Wiles, 2001). However, studies of physical therapists in Great Britain and Australia suggest that physical therapists base their treatment interventions on what was learned in school (Turner & Whitfield, 1997). Little research has been done regarding the propensity of physical therapists in the United States to adopt EBP.

Factors that facilitate adoption have been studied by Rogers and Shoemaker (1971) and Rogers (1983). Based on their work Cervero (1985) developed a model that suggested that the type of change, the educational intervention, the individual characteristics of the learner, and the work environment into which the innovation was diffused were primary factors. This study looked at two of the factors: personal characteristics and characteristics of the social system in the workplace and their relationship to the propensity to adopt EBP.

The review of the literature on self-directed learning demonstrated that multiple definitions of self-directed learning have been espoused. The definition for this study was from the work of Fisher et al. (2001).

> The amount of responsibility the learner accepts for his or her own learning. The self-directed learner takes control and accepts the freedom to learn what they view as important for themselves. The degree of control the learner is willing to take over their own learning will depend on their attitude, abilities and personality characteristics. (p. 516)

The review of the literature also explored the multiple models that have been proposed for self-directed learning. The literature reviewed suggested that physical therapists may possess varying degrees of self-directed learning (Kegan, 1994; Kegan & Lahey, 2000; Linares, 1999).

The review of the literature demonstrated that the characteristics of the social system in the workplace influence adoption of EBP (Barnard & Wiles, 2001; Eldridge & South, 1998; Squire & Cullen, 2001; Wilkinson et al.,1999). The review of the literature also looked at what was known about organization learning, the learning organization, and how the characteristics of the learning organization as described by Watkins and Marsick (1993; 1996) related to the adoption of EBP. Some parallels were identified between factors shown to promote adoption of EBP and the learning organization.

CHAPTER 3

METHODOLOGY

This chapter describes the research design used in this study. It includes the conceptual framework, the research paradigm, instrumentation, the study sample, data collection, data preparation, and data analysis.

The purpose of this study was to determine to what extent individual factors and the characteristics of the social system in the workplace influence the propensity of physical therapists to adopt evidence-based practice. The study was guided by the following questions:

1. To what extent do personal characteristics predict the propensity to adopt evidence-based practice?
2. To what extent do the characteristics of the social system in the workplace predict the propensity to adopt evidence-based practice?
3. To what extent do a combination of personal characteristics and the characteristics of the social system in the workplace predict the propensity to adopt evidence-based practice?

Conceptual Framework

This study was a partial implementation of a model proposed by Cervero (1985). Cervero suggested four factors that affect adoption: the educational intervention, the type of change, the personal characteristics of the individual professional, and the social system in which the potential adopter was located. This study tested two of those factors: personal characteristics of physical therapists and the characteristics of the social system in which physical therapists

worked. The study predicted the impact of personal characteristics of the individual physical therapist and the characteristics of the social system in the workplace on the propensity of physical therapists to adopt a particular innovation, EBP.

The model was composed of physical therapist's personal characteristics of various types. The social system was reflected by workplace characteristics. Since it was not known whether physical therapists had adopted EBP a variable called propensity to adopt EBP was measured. The general model of the study has been depicted in Figure 2.

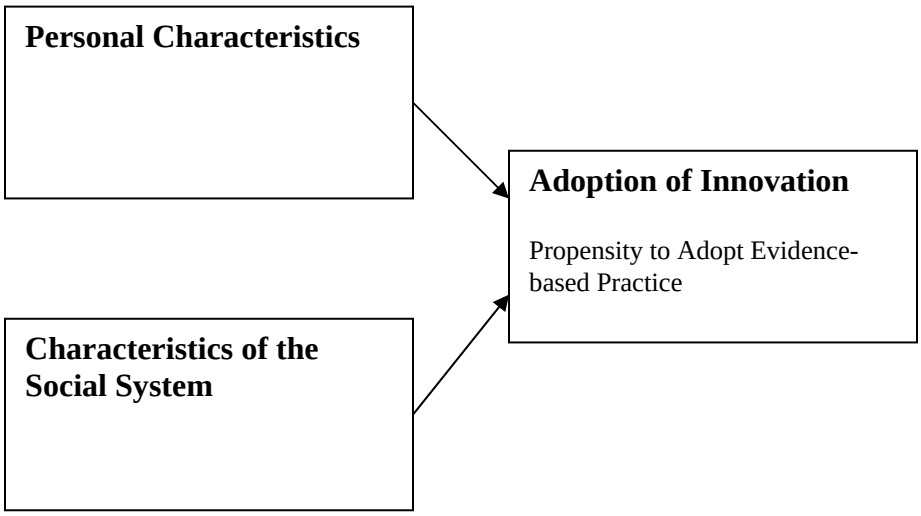

Figure 2. The general model for the method of research.

Once the general model was established, attention was turned to identifying variables that would measure the three broad classes of variables. This involved wide reading and examination of numerous instruments. Ultimately, this resulted in the construction of a single composite instrument that included measures of all three classes (Appendix A).

The specifics of the instrument development process will be presented in the section on instrumentation. However, the ends of the process are depicted in the fully specified model appearing in Figure 3.

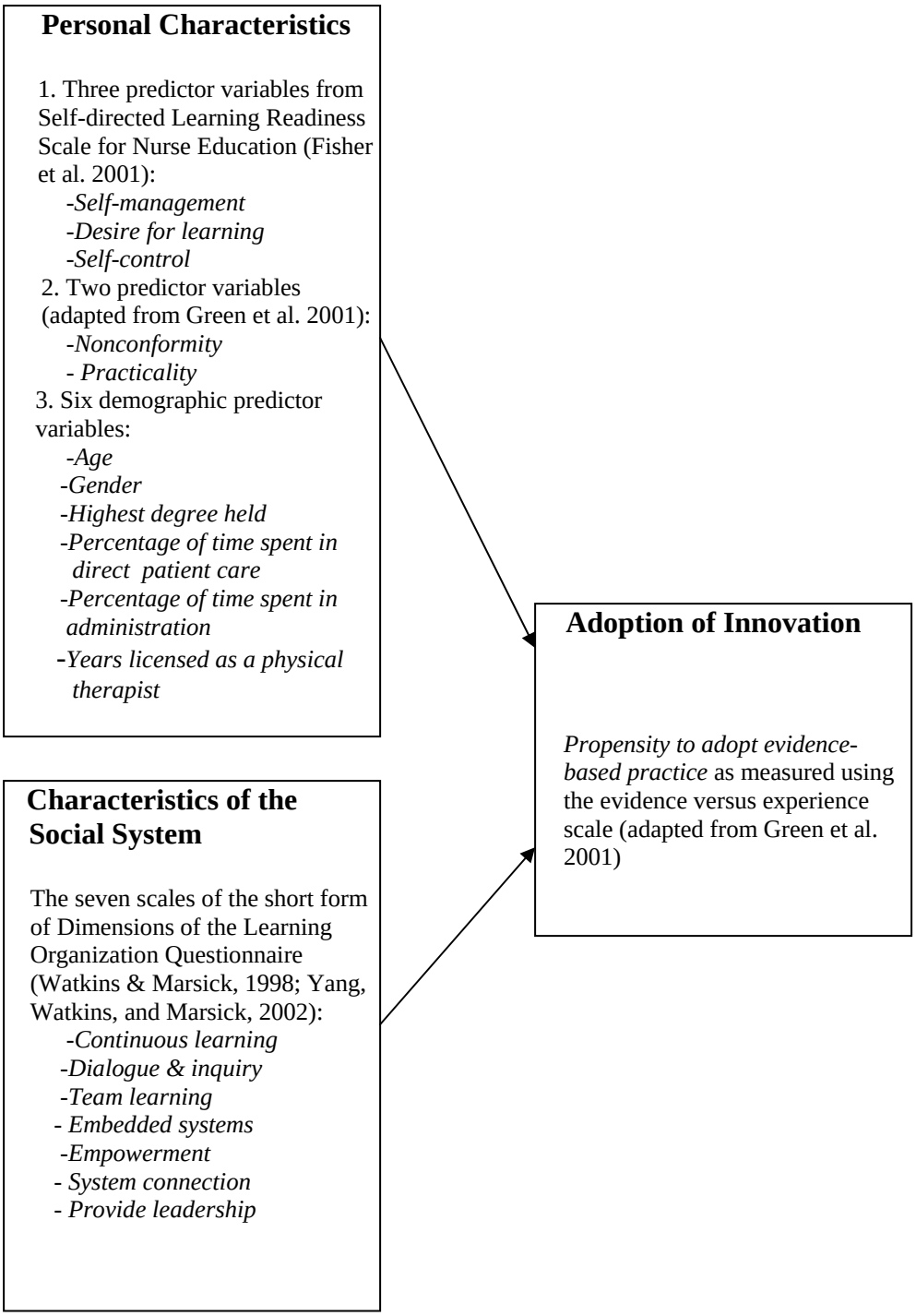

Figure 3. The fully specified model for the method of research.

Personal characteristics in this study were measured by a total of eleven variables. They were drawn from three distinct sources. One of the sources was the readiness for self-directed learning. The *Self-directed Learning Readiness Scale for Nurse Education* (SDLRSNE) designed by Fisher et al. (2001) and shortened for this study was used to assess the individual's perception of herself or himself as a self-directed learner. The three subscales of the instrument, *self-management, desire for learning,* and *self-control* were treated as independent variables. Details of the instrument will be described in the section on instrumentation. Two of the measures, *nonconformity* and *practicality*, were drawn from the Green, Gorenflo, and Wyszewianski (2001) instrument. Details of the instrument development will be described under instrumentation. The third source was simple background characteristics measured on the survey. We hypothesized that six variables (*age, gender, highest degree held, number of years licensed, percentage of time spent in direct patient care,* and *the percentage of time spent in administration*) would impact the propensity to adopt EBP.

For the social system a framework developed by Watkins and Marsick (1998) and later shortened by Yang, Watkins, and Marsick (2002) was employed. This was the work on the learning organization in which seven dimensions of the learning organization were proposed. These seven dimensions of the learning organization: ("*continuous learning, dialogue and inquiry, team learning, embedded system, empowerment, system connection,* and *provide leadership*") (Watkins & Marsick, 1998; Yang et al., 2002) served as the predictor variables of the characteristics of the social system.

The dependent variable, the *propensity to adopt EBP* was evaluated using the subscale "evidence versus experience" from the instrument developed by Green et al. (2001) and modified for this study. The central construct measured for the dependent variable was the "extent to

which scientific evidence is perceived as the best source of knowledge about what constitutes good practice, as oppose to clinical experience and authority" (Green et al., 2001, p. 5). Details of the development process of the subscale can be found in the instrumentation section.

The Research Paradigm

Quantitative survey research was the best methodology to answer the research questions guiding this study. Fowler (1993) identified three reasons for deciding to conduct survey research:

1. Probability sampling enables one to have confidence that the sample is not a biased one and to estimate how precise the data are likely to be. Data from a properly chosen sample are a great improvement over data from a sample of those who attend meetings, speak loudest, volunteer to respond, or happen to be a convenient poll.
2. Standardized measurement that is consistent across all respondents ensures that one has comparable information about everyone involved in the survey. Without such measurement, analyzing distributions or patterns of association is not meaningful.
3. A special-purpose survey may be the only way to ensure that all data needed for a given analysis are available and related. Even if there is information about some set of events, it may not be paired with other characteristics needed to carry out a desired analysis (p. 3).

Use of a survey was justified based on Fowler's (1993) criteria for using the survey method. First, the method allowed me to randomly select subjects without bias to participate in the survey. Second, by using a standardized instrument to measure the independent variables and the dependent variable consistent data were collected from each subject. Third, the research questions required finding out to what extent the independent variables separately and in

combination predicted the variance of the dependent variable. The method allowed for collection of information and pairing of information so that the relationship of the data could be analyzed.

Instrumentation

This section describes the process I undertook to develop the instrument, *Factors Affecting the Propensity to Adopt Evidence Based Practice in Physical Therapy*. See Appendix A for *Factors Affecting the Propensity to Adopt Evidence Based Practice in Physical Therapy*. The instrument measured the propensity to adopt EBP, physical therapists' perception of their readiness for self-directed learning, physical therapists' perception of the characteristics of the social system in their workplace, and personal characteristics.

Instrument Development Process

Since an appropriate instrument that would gather the desired data from the population sample to be studied was not located, a composite instrument was developed. Three instruments were developed into one composite instrument.

The development of the EBP section included clarifying the concept, locating and critiquing existing instruments, selecting and adapting the Green et al. (2001) instrument, reviewing the instrument with the help of the expert panel, and revising the questions by the methodologists. A self-directed learning instrumentation was located, critiqued, and shortened resulting in selection of questions based on a factor analysis of SDLRSNE (Fisher et al., 2001). The DLOQ (Watkins & Marsick, 1998) was located and reviewed in the literature. Based on a literature review and opinions of the expert panel an index of factors that would positively influence the propensity to adopt EBP was developed. The short form of the DLOQ (Watkins & Marsick, 1998; Yang et al., 2002) was located and the terminology " in my organization" was changed to "in my workplace" to reflect variety of contexts in which physical therapists work.

Background items were added. Then the instrument was pretested. Based on recommendations of the committee the background items were modified. Then the final instrument was constructed. See Table 3 for a summary of the instrument development process.

Table 3

Instrument Development Process

Steps in Process
1. Clarification of the concept of EBP
2. Location and critique of existing instruments for EBP
3. Location of the Green et al. 2001 instrument
4. Adaptation of the Green et al. instrument
5. Expert panel review of the adapted instrument
6. Revision of questions by the methodologists
7. Location and critique of existing instruments for self-directed learning
8. Shortening of the SDLRSNE (Fisher et al. 2001)
9. Location and critique of the DLOQ (Watkins & Marsick, 1998)
10. Development of an index of contextual factors that would positively influence the adoption of EBP
11. Location and critique of the shortened version of the DLOQ (Watkins & Marsick, 1998; Yang et al. 2002)
12. Addition of background items
13. Pretest of instrument
14. Final review and modification of instrument
15. Construction of final survey instrument.

Clarification of the Concept of EBP

The concept of EBP is an established force for improving practice (Cormack, 2001; Duncan, 1996; Rothstein, 2000, 2001; Sackett et al., 2000; Sackett & Rosenberg, 1995). However, it is not clear that the concept is understood or applied in the day-to-day practice of physical therapists in the United States (Gleeson & Cormack, 2002).

A cross-cultural study of physical therapists in England and Australia found that the choice of treatment techniques was based on what was taught in their initial training (Turner & Whitfield, 1997). Connolly et al. (2001) found that students at the University of Tennessee who had changed their bases for source of authority for treatments after research courses did not

sustain these beliefs after one year of practice in physical therapy. Instead students chose treatments used over the years by other therapists and what experts said worked as the source of authority in making clinical decisions. The authors speculated that the students did not see EBP practiced in the clinical environment. Gleeson and Cormack (2002) surveyed 313 physical therapists in a variety of clinical settings to determine their understanding of EBP. The results suggested there was lack of clarity of what constitutes EBP.

Because EBP was not a universally understood term by physical therapists, the survey described the propensity to adopt EBP. The term EBP was not used in the item questions in the instrument. Instead phrases that describe EBP were used. Instrumentation that evaluated the propensity to adopt EBP without using the phrase EBP was necessary to avoid individual interpretation of EBP. The following sections will discuss the location and critique of existing instruments on EBP and the modification of the instrument developed by Green et al. (2001).

Location and Critique of Existing Instruments on EBP

Existing questionnaires on EBP were located by searching Medline and www.BMJ.com for "evidence-based medicine" and "questionnaire," Google for "evidence-based medicine" and "questionnaire," and CINAL for "evidence-based practice." Six surveys were located that addressed adoption of EBP by physicians (Green et al., 2001; Greenhalgh, 1996; Mildon, Courtright, Rollins, Blicker, & Law, 2001; McColl, Smith, White, & Field, 1998; Olatunbosun, 1998; Young, Glasziou, & Ward, 2001). Four of the instruments (Mildon et al., 2001; McColl et al., 1998; Olatunbosun, 1998; Young et al., 2001) assumed that the respondents were familiar with a working definition of evidence-based medicine. No definition was provided for evidence-based medicine. Evidence-based medicine is the terminology used by medical doctors and is synonymous with EBP. Because it cannot be assumed that physical therapists have a consensus

understanding of what constitutes EBP the questionnaires were discarded. One instrument by Green et al. surveyed the attitudes of physicians when exposed to new information. This instrument will be described in the next section. Greenhalgh (1996) listed six questions in an editorial that practitioners could use as a checklist in individual patient encounters to determine if they were practicing EBP. Two of Greenhalgh's (1996) questions were used to guide the modification of questions in the instrument by Green et al. (2002).

Five instruments surveying adoption of EBP by physical therapists were reviewed (Closs & Lewin, 1998; Connolly et al., 2001; Gleeson, 2001; Pollock, Legg, Langhorne, & Sellars, 2000; Turner & Whitfield, 1997). The purpose of Turner and Whitfield's (1997) instrument was to advance an understanding of the reasons physical therapists choose treatment techniques. The instrument did not ask questions that would determine whether or not the physical therapist had a propensity to adopt EBP. In addition, no validity and reliability studies were reported in the literature on this instrument. Closs and Lewin's (1998) instrument was developed for the purpose of identifying barriers to research utilization. The instrument contained no questions that would assist in understanding the respondents' propensity to adopt EBP. No validity and reliability studies were reported in the literature on the instrument. The Pollock et al. (2000) instrument was developed for the purpose of determining perceived barriers to EBP by health professionals working in the field of stroke rehabilitation. The instrument did not contain questions that would aid in understanding the propensity to adopt EBP. No validity and reliability studies were reported in the article on the instrument.

An attitudinal survey by Connolly et al. (2001) was developed for the purpose of conducting a longitudinal survey of students to examine "(1) their perception of knowledge with respect to research, (2) their perception of what should be used (EBP or traditional protocols),

(3) their perception of what should be used in a clinical setting for patient management" (p. 1127).

The second construct the authors evaluated was the source of authority for clinical decision-making. Questions 4, 5, 6, and 7 "On their face" were consistent with identifying the source of authority for making treatment decisions. These questions would have been excellent questions to determine the propensity to adopt EBP because the questions asked the students to choose whether clinical decisions should be based on traditional protocols or research evidence. Unfortunately, the validity and reliability of the instrument were not established.

The instrument was designed by the faculty of the Department of Physical Therapy, University of Tennessee with the assistance of biostatisticians from the University of Tennessee. The authors reported that clarity, content validity, and construct validity were evaluated by a panel of experts from the American Physical Therapy Association section on research to ensure that the questions accurately reflected the objectives of the study. Based on the experts review the final questionnaire was developed (Connolly et al. 2001). No reports of the reliability of the instrument were provided in the journal article describing the research. E-mail to one of the authors requesting information on reliability studies received the following reply, "We did not do reliability studies" (B. Connolly, personal communication, April 20, 2002).

Gleeson (2001) developed the fifth instrument reviewed. The purpose of the instrument was to determine to what extent EBP was understood and applied in the clinical setting. The instrument consisted of 21 questions divided into three major categories. The categories were demographics, perceptions about evidence, and perceptions about clinical research.

The psychometric adequacy of this instrument had not been submitted to rigorous study. Gleeson stated that no reliability studies were performed. The content validity was evaluated by

sending the instrument to 30 physical therapists in Texas who served as clinical instructors of physical therapy students from Texas Women's College. Based on the comments received from the clinical instructors the items on the questionnaire were modified (P. Gleeson, personal communication, April 25, 2002). An expert in EBP, Mark Ebell, M. D., M. S., identified multiple flaws in the questions such as questions that refer to research instead of EBP and questions suggesting the author understood EBP as dichotomy rather than a continuum (personal communication, M. Ebell, May 16, 2002).

Selection of Green et al. 2001 Instrument

Green et al. (2001) developed a psychometric instrument to classify physicians based on specific combinations of three scales. The scales were: "a. belief in evidence vs. experience as the basis of knowledge"; "b. willingness to diverge from common or previous practice"; and "c. sensitivity to pragmatic concerns of practice" (Green et al. 2002, p. 2). The authors created several questions for each of the hypothesized factors (evidence vs. experience, nonconformity, and practicality) and refined them for clarity. The questions were further refined by a group of active physicians who were members of the American Academy of Family Practice. An 18 item psychometric instrument was prepared and pilot tested on 112 family physicians. The instrument was modified and tested on an additional 1, 217 family physicians. The results of the second version were used to develop a third version. The third version was tested on 64 family physicians.

> Refinement of the instrument at each iteration was begun with principal components factor analysis with orthogonal varimax rotation. The eigenvalues from the factor analysis were used to determine the number of factors in the optimum solution. The instrument's questions were then assigned to these factors based upon which factor they

> loaded most heavily on in the rotated solution. Cronbach's alpha was calculated for each factor scale. At each of the iterations questions loading less than 0.35 on all factors in the varimax solution were dropped. Questions loading on two factors were examined for revision for clearer wording in the subsequent draft. New questions were created for the next draft to add to factor scales with too few questions loading on them (Green et al., 2002, pp. 7-8).

Each factor produced three psychologically meaningful scales. The scales were named: "evidence-experience, nonconformity, and practicality" (Green et al., 2002, p. 7).

Adaptation of the Green et al. (2001) Instrument

The Green et al. (2001) instrument required modification in two ways. First, the referenced peer group needed to be changed from physicians to physical therapists. Second, because EBP is not a commonly understood term, the language was changed to reflect the natural language of physical therapists. This included defining two terms that could be open for interpretation (scientific studies and practice guidelines). The changes were presented to the methods committee. After review and revision the instrument was deemed ready for review by a panel of experts.

Expert Panel Review of the Adapted Instrument

An expert panel of five physical therapists reviewed the instrument for clarity, natural language, and validation of content validity for physical therapists. The experts had experience in a variety of practice settings for physical therapists. The panel consisted of a director of a physical therapy assistant education program with previous experience as a physical therapist in the United States Army, two academic coordinators of clinical education for physical therapy assistant education programs, one with previous experience in a rehabilitation hospital and one

with experience in an acute care setting, a director of an outpatient orthopedic clinic, and a former academic coordinator of clinical education for a master of physical therapy program housed in a state university with previous experience in a teaching hospital. These particular individuals were chosen because they understood the practice of physical therapy.

The expert panel met for two hours at the University of Georgia. Facilitators for the session included the major professor and one of the methodologists of the research committee. I was an expert panel member during the session. The objectives for the session were explained and a statement of confidentiality of the meeting was verbalized. The panel was provided with the modified Green et al. (2001) instrument. The panel members completed the instrument. The floor was then open for discussion. Each item was discussed and modifications were suggested. Additional recommendations were made regarding the population to be sampled and the format of the instrument. The session was recorded by audiotape. The audiotape was summarized in writing for the methods committee.

Revision with Methodologists

A written summary of the expert panel's suggestions was presented to the two methodologists. The methods committee made recommendations for the changes in eight of the items. See Tables 4, 5, and 6 for a summary of the iterations of the items of each construct.

Location and Critique of Existing Instruments on Self-directed Learning

Self-directed learning was measured using a quantitative instrument. This section will review several quantitative instruments considered for measuring self-directed learning. The most widely reported instrument in the literature has been the *Self-directed Learning Readiness Scale* (SDLRS) developed by Guglielmino (1977). Following a review of the literature,

Table 4

Items on the Original and Modified Instrument for Dimension 1 of the Green et al. (2001) Instrument: Evidence vs. Experience

Original Item	Modified Item	Modifications by Expert Panel and Methods Committee
Clinical experience is more important than randomized control trials.	In making clinical decisions clinical experience is more important than scientific studies.	The expert panel suggested: In making clinical decisions, I value clinical experience more than scientific studies.
Evidence-based medicine makes a lot of sense to me.	In making clinical decisions, seeking evidence from scientific studies makes a lot of sense to me. In making clinical decisions, assessing the quality of the research makes a lot of sense to me.	Not applicable
Clinical experience is the most reliable way to know what really works.	Not applicable	Not applicable
Patient care should be based where possible on randomized control trials rather than the opinions of respected authorities.	Patient care should be based where possible on scientific studies rather than the opinions of respected authorities.	The expert panel suggested: Patient care should be based where possible on scientific studies rather than the opinions of experienced practitioners.
Patient care should be based where possible on randomized control trials rather than the opinions of respected authorities.	Patient care should be based where possible on scientific studies rather than the opinions of respected authorities.	The methods committee suggested: Patient care should be based where possible on scientific studies rather than the opinions of respected practitioners.
The best practice guidelines are based on the results of randomized control trials.	The best ‘practice guidelines’ are based on evidence from scientific studies rather than consensus opinion.	The expert panel suggested: Good practice guidelines are based on evidence from scientific studies rather than consensus opinion.
Assessing the quality of research is not very practical in real patient care.	Not applicable	The methods committee suggested: Critical appraisal of the literature and its relevance to the patient are not very practical in real patient care.
The best practice guidelines are based on the results of randomized control trials.	The best ‘practice guidelines’ are based on evidence from scientific studies rather than consensus opinion.	The methods committee suggested: Practice guidelines for physical therapy should be based on evidence from scientific studies rather than consensus opinion.
Evidence-based medicine is not vey practical in real patinet care.	Seeking relevant evidence from scientific studies is not very practical in real patient care.	Not applicable

Table 5

Items on the Original and Modified Instrument for Dimension 2 of *the Green et al. (2001)*

Instrument: Nonconformity

Original Item	Modified Item	Modifications by Expert Panel and Methods Committee
I am uncomfortable practicing in ways different from other doctors.	I am comfortable practicing in ways different from other physical therapists.	Not applicable
The opinions of respected authorities should guide clinical practice.	Not applicable	The expert panel suggested: The opinions of experienced practitioners should guide clinical practice.
The opinions of respected authorities should guide clinical practice.	Not applicable	The methods committee suggested: The opinions of respected practitioners should guide clinical practice
I am often critical of accepted practices.	I am sometimes critical of accepted physical therapy practices	The expert panel suggested: I am sometimes critical of accepted physical therapy treatments.
I am often critical of accepted practices	I am sometimes critical of accepted physical therapy practices	The methods committee suggested: I am often critical of accepted physical therapy treatments
My colleagues consider me to be someone who marches to my own drummer.	Not applicable	The expert panel suggested: Delete the question.
My colleagues consider me to be someone who marches to my own drummer.	Not applicable	The methods committee suggested: My colleagues consider me to be someone who makes my own decisions about treatments.
It is not prudent to practice out of step with other physicians in my area.	It is not prudent to practice out of step with other physical therapists I know.	The expert panel suggested: It is not generally accepted to practice differently from other physical therapists I know.
It is not prudent to practice out of step with other physicians in my area.	It is not prudent to practice out of step with other physical therapists I know	The methods committee suggested: It is not a good idea to use treatments different from other physical therapists know.

Table 6

Items on the Original and Modified Instrument for Dimension 3 of the Green et al. (2001) Instrument: Practicality

Original Item	Modified Item	Modification by Expert Panel and Methods Committee
I don't have time to read up on every practice decision.	Not applicable	Not applicable
I follow guidelines if they are not too much of a hassle.	Not applicable	Not applicable
I am too busy with patient care to keep up with the recent literature.	Not applicable	Not applicable
I am uncomfortable doing things differently from the way I was trained.	I am comfortable doing things differently from the way I was trained.	Not applicable
I follow guidelines as long as they don't interfere too much with the flow of patients.	Not applicable	Not applicable

Guglielmino (1977) used a modification of the Delphi technique to develop a consensus opinion among fourteen experts in self-directed learning. In the initial round Guglielmino (1977) stated her assumptions regarding self-directed learning. The expert panel was then asked to name and rate characteristics they considered necessary for self-directed learning. The items that *received a rating of desirable or better were used to construct the SDLRS. The questionnaire was* a 58-item Likert-type scale. The questionnaire asked individuals to rate their perception of the degree to which they possessed certain attitudes, skills, and traits associated with self-directed learning (Long, 1987). Guglielmino (1977) then administered the questionnaire to 307 middle class subjects in Georgia, Canada, and Virginia. A reliability coefficient of .87 was estimated. Based on the results of the three round Delphi surveys consensuses on the predominant characteristics of a highly self-directed learner were described.

A factor analysis of the Gugliemino (1977) instrument by West and Bentley (1990) identified eight factors: openness to new learning opportunities, self-concept as an effective learner, initiative and independence in learning, acceptance of responsibility for one's own learning, love of learning, creativity, positive orientation to the future, and ability to use basic study skills and problem-solving skills. To obtain a better understanding of the SDLRS, West and Bentley (1990) studied a sample of public school teachers and administrators using a confirmatory factor analysis. They found the factors were highly correlated and a six-factor model was found to be as effective as the original eight-factor model in describing the theoretical nature of the self-directed learning readiness construct. The six factors were: love of learning, self-confidence as a learner, openness to a challenge, inquisitive nature, self-understanding, and acceptance of responsibility for learning.

Numerous studies have provided evidence of the reliability and validity of the SDLRS (McCune, Guglielmino, & Garcia, 1990). Long and Walsh (1992) suggest that studies of the SDLRS have overall resulted in agreement regarding the validity of the instrument. However, several studies have questioned the reliability and validity of the SDLRS (Bonham, 1991; Field, 1989; Long & Agyekum, 1988).

In summary, the SDLRS has been the most widely used tool for determining an individual's readiness to learn (McCune, 1988). The instrument was shown to reliably test the individual's state of self-directedness in an adult college age population (Guglielmino, 1977). Subsequent studies have confirmed the reliability and validity of the instrument (McCune, Guglielmino, & Garcia, 1990).

The validity for the instrument has been challenged by Field (1989) and Bonham (1991). The challenges to the validity have not deterred the use of the instrument as a measure of self-directed learning. Today it continues to be widely used to evaluate self-directed learning.

The instrument was not suitable for this study for several reasons. First, the challenges to the validity were worrisome because respected scholars have questioned whether or not the instrument measures an individual's readiness to learn. Second, I believed the length of the instrument in combination with the other factors being examined was too long for a busy clinician to complete, possibly limiting the response rate.

Oddi (1984) developed an instrument for self-directed continuing learning that measured self-directedness as a personality construct. Based on recurring themes in the writings of experts on self-directed learning and empirical research Oddi (1984) developed an extensive list of personality characteristics of the self-directed continuing learner. The personality characteristics hypothesized as essential were placed in one of three broad overlapping dimensions. Each dimension was placed on a continuum with two anchors: "(a) Commitment to Learning versus Apathy or Aversion to Learning, (b) Cognitive Openness versus Defensiveness, and (c) Proactive Drive versus Reactive Drive" (Oddi, 1984, p. 6). At one end of the continuum was the person who exhibited characteristics of the self-directed learner. At the other end of the continuum was the nonself-directed continuing learner. The first dimension, proactive drive versus reactive drive, focused on the individual's ability to initiate and sustain interest in learning without external reinforcement. The second dimension, cognitive openness versus defensiveness, incorporated openness to innovations, ability to adapt to change, and tolerance of uncertainty. The third dimension, commitment to learning versus apathy was characterized by positive attitudes toward learning activities. Prepilot and pilot tests refined the characteristics to 26 items.

The test was then administered to law students (n = 110), adult education students (n = 83), and nursing students (n = 78). Two items were removed from the instrument. The remaining 24 items demonstrated an internal consistency of .87 and a test/retest reliability of .89. Estimates of construct validity were determined by correlating the scores on the Oddi Continuing Learning Inventory (OCLI) with the Leisure Activity Scale, the Internal-External Scale, and the Shipley Adjective Checklist. The results of the correlation with these instruments suggested the OCLI was a valid tool for identifying self-directed continuing learning.

Oddi, Ellis, and Robertson (1990) distributed surveys to 251 nurses in a hospital in the Midwest. The researchers found the total scores on the OCLI correlated positively at low levels with the Job Activity Survey and learning modes of inquiry, self-instruction, and performance. No correlation was found between the OCLI and the subscale for measuring group instruction and attendance at continuing education programs. This study extended the construct validity from the original study. The estimate of the construct validity was obtained by using an instrument that measures learning activities on the job as opposed to measuring leisure time activities.

Six (1989) demonstrated that the three empirically derived factors of the Oddi Continuing Learning Inventory (OCLI) were robust across study samples. The results of his study strongly suggested the underlying dimensions of the OCLI demonstrated robustness and the instrument was generalizable to a wider range of populations.

The OCLI was a promising instrument for this study for several reasons. First, the construct validity had been established (Oddi, 1984; Oddi et al., 1990). Second, the instrument had been demonstrated to be generalizable to several populations. Third, the number of items on the instrument were in keeping with the economy of items that when combined with other

sections on the instrument would result in an instrument of a length that would not interfere with the response rate (T. Valentine, personal communication, November 15, 2002).

Use of Oddi's instrument presented several problems. She maintained strict legal control over the instrument. Her copyright attorney would not allow the OCLI to be included with another instrument. Rather, the OCLI had to be issued as a separate instrument. According to her legal contract, the instrument could not be published in the dissertation.

In response to the questionable validity of Guglielmino's SDLRS (1977) Fisher et al. (2001) developed a self-directed learning readiness scale for nursing education (SDLRSNE). The Reactive Delphi Process was used to develop the instrument. First, based on a review of the literature a bank of items was developed listing the attitudes, abilities, and characteristics of the self-directed learner. A total of 93 items were deemed to reflect the attributes, skills, and motivational factors of the self-directed learner. In accordance with the Delphi technique, a panel of experts was used to gain consensus about the characteristics required for self-directed learning. The panel consisted of nurse administrators and educators with previous research and teaching experience in self-directed learning. Each member independently evaluated each item to determine the degree to which the item described the self-directed learner. Using a Likert type scale the panel members scored the items from 1 strongly disagrees to 5 strongly agrees. For an item to be retained the item had to receive at least 80% agreement from the panel. After two Delphi rounds, agreement consensus was achieved for 45 items. Seven items that did not achieve consensus by the panel of experts were included because the researcher believed these items were important for the structure of the scale. A third Delphi round was not carried out, because the researchers believed that the refinement of the scale could be best achieved by piloting the 52 items and using item-total correlation for item selection.

The questionnaire was pilot tested on a convenience sample of 201 nursing students. Data were analyzed in three ways: principal components analysis with Varimax rotation, Cronbach's alpha, and correlation between item scale and total score. To test for unidimensionality item-total correlation coefficients were conducted. Because ten of the items had a coefficient of less than .30 they were dropped from the scale.

Factor analysis of the items by Fisher et al. (2001) identified three clusters of items: self-management, desire for learning, and self-control. In the study I used a shortened version of the survey that included only those items that loaded at .45 criterion or higher on three-factor analysis. See Table 7 for the factor analysis.

The internal consistency was estimated using Cronbach's Alpha. Reliability estimates for the total item pool was .92. Reliability estimates for subscales were: self-management subscale .86, desire for learning subscale .85, and self-control subscale .83. Ultimately, I decided to use this instrument to determine the respondent's perception of themselves as self-directed learners for the following reasons. The researchers concluded that the self-directed learning instrument developed and piloted in the study was homogenous and valid. Evidence of the content validity of the instrument was confirmed from the development of the scale items from the literature, validation by the Delphi technique, and testing with exploratory factor analysis. Construct validity was established by factor analysis. Reliability was established using Cronbach's Alpha.

The instrument had several limitations. The instrument had been tested only on Australian nursing students. Further research was needed to confirm the factor structure when applied to different racial groups.

Table 7

Factor Analysis

Item	Item Loading
Factor 1:Self-management.	
I manage my time well.	.758
I am self-disciplined.	.701
I am organized.	.694
I set strict time frames.	.615
I have good management skills.	.606
I am methodical.	.597
I am systematic in my learning.	.573
I set specific times for my study.	.514
I problem solve using a plan.	.510
I prioritize my work.	.487
Factor 2:Desire for learning.	
I want to learn new information.	.845
I enjoy learning new information.	.830
I have a need to learn.	.745
I enjoy a challenge.	.690
I enjoy studying.	.611
I critically evaluate new ideas.	.465
Factor 3:Self-control.	
I prefer to set my own goals.	.681
I like to make decisions for myself.	.600
I am responsible for my own decisions/actions.	.527
I am in control of my life.	.474
I have high personal standards.	.473
I prefer to set my own learning goals.	.452

Location of an Instrument to Examine the Characteristics of the Social System

In developing a section of the instrument to measure the characteristics of the social system, I considered the DLOQ (Watkins & Marsick, 1998), the short version of the DLOQ (Watkins & Marsick, 1998; Yang et al. 2002), and an index of features in the workplace of physical therapists that might positively influence the propensity of physical therapists to adopt EBP. First, the DLOQ (Watkins & Marsick, 1998) was located and reviewed in the literature. Second, based on a review of the literature and interviews with an expert panel of physical therapists, I developed an index of features in the workplace of physical therapists that would

positively influence the propensity to adopt EBP. Third, the short version of the DLOQ (Watkins & Marsick, 1998; Yang et al. 2002) was located and reviewed. Ultimately, I decided on the short version of the DLOQ (Watkins & Marsick, 1998; Yang et al., 2002). The short version of the DLOQ (Watkins & Marsick, 1998; Yang et al., 2002) was chosen because it preserved the best items from each of the measures of the original DLOQ (Watkins & Marsick, 1998) and maintained the original theoretical structure. Furthermore, the short version measured a distinctively different set of characteristics from the other two sections in a succinct manner. The development and validation of the instrument for the characteristics of the social system will be discussed in the next section.

Instrument Development and Validation for Characteristics of the Social System

Watkins and Marsick (1993; 1996) developed a model for the learning organization. The action imperatives for the learning organization formed the basis for the development of the DLOQ (Watkins, Yang, & Marsick, 1997). Several studies have been conducted that established the construct validity, content validity, predictive validity, and the reliability of the DLOQ (McHargue, 1999; Selden, 1998; Sta. Maria, 2000; Watkins, Yang, & Marsick, 1997; Yang, Watkins, & Marsick, 1998).

Based on their research on the learning organization Watkins and Marsick (1998) generated a pool of six items for each of the dimensions of the learning organization. Content validity was first obtained by the authors through expert analysis. Content analysis was further substantiated by the degree of consensus across 191 respondents that the dimensions of the learning organization should be present in their work. Respondents were asked to rate the presence of each of the items in their organization and how things should be in their organization

using a Likert scale. Means for “should be” ranged from 4.98 to 5.53 indicating agreement with Watkins and Marsick’s dimensions (Watkins et al., 1997).

Yang et al. (1998) established the construct validity for the scale measuring the dimensions of the learning organization. Multiple organizations were surveyed. A total of 469 valid responses were returned. Confirmatory factor analysis was used to assess the construct validity for the measure of the dimensions of the learning organization. Supporting evidence of validity for the instrument was acquired from numerous sources including: best model fit among alternative models, nomological network among dimensions of the learning organization, and performance outcomes. The study demonstrated strong evidence of construct validity for the scale measuring the dimensions of the learning organization. From their study they concluded the DLOQ was a useful tool for researchers to measure the learning organization.

The reliability for the DLOQ was established by McHargue (1999); Selden (1998); Watkins et al. (1997), and Yang et al. (1998). Watkins et al. found the alpha coefficients for each dimension of the scale for the dimensions of the learning organization ranged from .72 to .86. Selden (1998) found that Cronbach’s alpha coefficients for each dimension of the learning organization ranged from .68 to .84. The coefficient alpha for the dimensions of the learning organization measured in the DLOQ in the study by Yang et al. ranged from .75 to .85. McHargue (1999) found that the coefficient alpha ranged from .81 to .90.

The DLOQ (Watkins & Marsick, 1998) contains 43 items. I was concerned about the length of the DLOQ in combination with the measures for propensity to adopt EBP and self-directed learning. I attempted to develop an index of items to measure contextual support based on a review of the literature and interviews with the expert panel. Members of my committee expressed concern that the index was similar to the items in Section I measuring the propensity

to adopt EBP and Section III measuring self-directed learning (T. Valentine, personal communication, November 15, 2002; K. Watkins, personal communication, November 15, 2002).

Ultimately, I settled on the short version of the DLOQ (Watkins & Marsick, 1998; Yang et al., 2002) that contained 21 items. The short DLOQ (Watkins & Marsick, 1998; Yang et al., 2002) was chosen based on the results of refinement of the instrument by Yang et al. (2002). In a recent publication Yang et al. (2002) published a shortened version of the DLOQ (Watkins & Marsick, 1998; Yang et al., 2002) preserving the best items from each of the measures and maintaining the original theoretical structure. The construct validity was investigated by evaluating the number of dimensions believed to explain the inter-relations among items included in the instrument. The instrument was refined using the model generating method and a series of confirmatory factor analysis for the exploratory sample. The authors reported that "the refined measures formed adequate measurement models for both exploratory and confirmatory samples" (Yang et al., 2002, p. 25) giving evidence of construct validity for the short form of the DLOQ (Watkins & Marsick, 1998; Yang et al., 2002). The items that were retained were tested with the validation sample. The sample used for construct validation came from a data set of the ongoing process of development and validation of the DLOQ (Watkins & Marsick, 1998). The total size of the nonrandom sample from multiple organizations was 836 subjects (Yang, et al.).

The short version of the DLOQ (Watkins & Marsick, 1998; Yang et al., 2002) was incorporated with the two other instruments, SDLRSNE (Fisher et al., 2001) and the Green et al. (2001) instrument without excessively increasing the length of the questionnaire. The stem "in my organization" was replaced with "in my workplace" to relate to the language of the variety of contexts in which it was administered.

Description of Composite Instrument

A composite instrument was developed, C*linical Decision Making for Physical Therapists*. See Appendix B. The instrument measured the 12 variables in the operational model and some background variables. Items 1, 3, 4, 7, 9, 10, 12, and 13 measured the dependent variable, propensity to adopt EBP from the modified version of Green et al. (2001) instrument. Items 2, 5, 6, 8, 11, and 14 measured the independent variable, nonconformity, from the modified version of Green et al. instrument. Items 15, 16, 17, 18, and 19 measured the independent variable, practicality, from the modified version of Green et al. instrument. Items 20-40 measured the independent variable, the dimensions of the learning organization, from the shortened version of the DLOQ (Watkins & Marsick, 1998; Yang et al., 2002). Items 41-62 measured the independent variable, the individual's self-assessment of herself/himself as a self-directed learner, using the SDLRSNE (Fisher et al., 2001). The final section, background information, contained seven questions, items 63-69.

Pretest of the Composite Instrument

Pretest of the instrument consisted of two phases. In phase one a convenience sample of 27 physical therapists holding license in the state of Georgia was mailed a mock cover letter, the composite instrument, an 11 item pretest questionnaire, a letter requesting participation in pre-testing of the cover letter, and the composite survey instrument, *Clinical Decision Making for Physical Therapists* (Appendix B). Sixteen physical therapists returned the 11-item questionnaire and composite instrument for a response rate of 59%. The physical therapists were asked to evaluate the content and format of the cover letter and the composite instrument, *Clinical Decision Making for Physical Therapists.* The majority of the participants reported no problems with the format, clarity of directions, or clarity of items in the composite instrument. A few

respondents raised some issues, but after discussion with one of the methodologists we decided those suggestions were not necessary. Suggestions for the cover letter were incorporated into the cover letter sent out in the first mailing (Appendix C).

Final Review and Modification of the Instrument

The committee suggested the name of the instrument be changed to more accurately reflect the overall purpose of the instrument. The name was changed to *Factors Affecting the Propensity to Adopt Evidence Based Practice in Physical* Therapy. The name change was made and approved by the chair of the committee and the internal review board.

Based on recommendations from the chair and one of the methodologists the background information questions were modified to more accurately and efficiently collect information on the characteristics of the sample. Information gathered included gender, race, highest degree held, employment setting in which the participant spent the majority of time, the percentage of time spent in daily professional activities, date of birth, and number of years as a licensed physical therapist.

Five practicing physical therapists holding licenses in the state of Georgia were asked to review the finalized composite instrument. No significant changes related to clarity of the items or directions were recommended. As a result the composite instrument, *Factors Affecting the Propensity to Adopt Evidence Based Practice* (Appendix A) was reproduced for mailing to participants.

Sample

The sample consisted of all physical therapists who were licensed by the state of Georgia for the licensure period 2001-2003. The roster obtained from the licensing board of the state of Georgia identified 3,897 potential candidates.

My goal was to create a sample large enough to generalize to the population of all physical therapists licensed by the state of Georgia. Under the advice of a statistician I used the rough rule of thumb of 20 cases per variable. The decision was based on 20 subjects per variable with an approximate maximum of 33 variables that might be used for analyzing the data using multiple regression at the .05 alpha level. (Chassan, 1979; Wisenbaker, personal communication, February, 2003). This resulted in an *n* of 660. Based on a predicted 50% response rate, 1320 names were randomly selected from a list of all licensed physical therapists in the state of Georgia (*N* = 3,897) using *BCC Software* package.

Data Collection

Type of postage, monetary incentives, the sponsorship of a university, personalization of the cover letter, hand signed cover letter, color of the survey instrument, and follow-up notification have been reported to increase response rates (Erwin & Wheelright, 2002; Fox, Crask, & Kim, 1988; Paxon, 1995; Salant & Dillman, 1994). Thus, the initial mailing that was sent to 1320 physical therapists licensed in the state of Georgia in an envelope with the return address of the Department of Adult Education in the upper left hand corner and bore an individual postage stamp. Enclosed in the packet was a cover letter on the Department of Adult Education letterhead that contained a personal saluatation to each physical therapist, an explaination of why the survey was being done, and solicitation for participation (Appendix C), the survey on green paper (Appendix A), *Research Information for the Participants*, a dollar bill, and a stamped self-addressed envelope. A follow-up reminder post-card (Appendix D) was mailed 10 days after the initial mailing to all nonrespondents. Thirty-five days later nonrespondents were contacted again by mail and sent another questionnaire and different cover letter (Appendix E). All surveys were coded with a respondent number on the back. As the

surveys came in I removed the name from the mailing list and sent reminders only to those who had not responded. All surveys were returned to the Department of Adult Education in an envelope that bore an individual postage stamp. A box was be set up in the administrative office that identified the box as a storage place for the surveys.

A total of 959 surveys were returned for a response rate of 73%. Ninety-one were deemed ineligible because the respondents marked an item indicating they were not currently working in the field of physical therapy. Nine respondents returned a blank survey indicating they did not wish to participate in the survey. Eight surveys were not useable because 16 or more items were left blank. Seven respondents indicated they did not meet the criteria of currently working in the field of physical therapy ("I work alone." "I am working as a veterinary physical therapist and am not treating human patients." "I am currently teaching." "Am solely doing research." "I am only working weekend PRN approximately 10-12 hours per month. Therefore, I do not feel I can adequately answer these questions." "I am working part-time at this time and do not feel that my situation fits your survey. " "41 years, but out of the field for 27 as a hospital administrator"). Thirteen more surveys were returned too late for the data entry process. They were received by the researcher fully one month after the deadline for return of surveys. Eight hundred and thirty one of the surveys were useable. See Table 8 for a summary of the response rate.

Table 8

Response Rates from Survey Mailings

	Rate of Return
a. Number of surveys mailed	1320
b. Number of surveys returned	959
Raw response rate b/a	73%
c. Number of surveys returned undeliverable	39
Adjusted response rate b/a-c	75%

Data Preparation

This section will describe the data preparation and analysis. It includes: cleaning the data, calculating the scale scores, and calculating the reliability for each of the dimensions on each of the measures using coefficient alpha. The task of data preparation involved multiple steps. First, I cleaned the questionnaire. This meant that I went through each questionnaire to make sure that whoever entered the data would know which marks were extraneous and which marks were actual answers. Then I expunged obviously erroneous data such as when the year you were born was listed as New York. I marked that as missing data. Second, using a list of years and ages, the year born was recoded to the age of respondent before entering the data.

Next, each useable survey was entered into a *Microsoft* spreadsheet using the code number that was printed in the right hand bottom corner of the survey as the identification number. To ensure the accuracy of the data entry two separate checking processes were conducted. Under the first process a team of five compared the data entered against the raw surveys correcting errors as they were found. As a subsequent check a team of two spot-checked 10% of the data entries. Two minor errors were found and corrected. The spreadsheet was then transferred to the *SPSS 11.5,* a statistical software package. As a final check I worked closely with one of the methodologists to run descriptive statistics to identify anomalies in the data. The data had no major anomalies. All means were determined to be within the range of possible values.

Next, questionable items were discussed with one of the methodologists for inclusion or exclusion from the data set. For example, when two numbers on the scale were circled the average was calculated and entered into the database. Item number 66; “Employment setting in which you spend most of your time” posed a problem. Approximately five percent of the

respondents entered multiple places of employment. Thus a separate code (# 9) was created for multiple places of employment.

The fifth step consisted of creation of scale scores for the three major measures. The first section of the survey, "Factors Affecting the Propensity to Adopt Evidence Based Practice," was adopted from Green et al. (2001). The instrument contained three subscales. One represented the central dependent variable of the study, the propensity to adopt EBP. The other two, nonconformity and practicality, represented personal characteristics.

In preparing the scale scores the first step was to reverse code several items that needed reverse coding. Each item was rated on a six point scale with 1 = Disagree and 6 = Agree (See Appendix A). Negative items were recoded so that all item responses were in the same direction.

Next Cronbach's alpha was assessed to measure how well the items in each construct measured a single unidimensional variable. Upon examination of the print out one of the items in the practicality scale had a corrected total item correlation of .07 with the scale. Once the item was deleted the inter-item reliability improved significantly to Alpha = .66. Inter-item reliability for the nonconformity scale was Alpha = .56. The inter-item correlation for the evidence versus experience scale was .83 demonstrating evidence that there was good reliability in the evidence versus experience scale (Nunnally, 1970).

Ultimately, the dependent variable, *propensity to adopt EBP*, used in the analyses consisted of items 1, 3, 4, 7, 9, 10, 12, and 13 from the evidence versus experience scale (Green et al., 2001). Items 1, 7, 10, and 13 were reversed. Table 9 depicts the variable. The *nonconformity* scale (Green et al., 2001) used in the analyses consisted of items 2, 5, 6, 8, 11, and 14. Items 5, 6, and 11 were reversed. Table 10 depicts the variable. The *practicality* scale

(Green et al., 2001) used in the analyses consisted of items 15, 16, 17, and 19. Items 15, 16, 17, and 19 were reversed. Table 11 depicts the variable.

Table 9

Items Measuring Propensity to Adopt EBP (Green et al., 2001) in the Factors Affecting the Propensity to Adopt Evidence-Based Practice Survey

1.	I making clinical decisions, I value clinical experience more than scientific studies. (Reversed)
3.	In making clinical decisions, seeking evidence from scientific studies makes a lot of sense to me.
4.	In making clinical decisions, assessing the quality of the research evidence makes a lot of sense to me.
7.	Clinical experience is the most reliable way to know what really works. (Reversed)
9.	Patient care should be based where possible on scientific studies rather than the opinions of respected practitioners.
10.	Critical appraisal of the literature and its relevance to the patient are not very practical in real patient care. (Reversed)
12.	Practice guidelines for physical therapy should be based on evidence from scientific studies rather than consensus opinion.
13.	Seeking relevant evidence from scientific studies is not very practical in real patient care. (Reversed)

Table 10

Items Measuring Nonconformity (Green et al., 2001) in the Factors Affecting the Propensity to Adopt Evidence-Based Practice Survey

2.	I am comfortable practicing in ways different from other physical therapists.
5.	I am more likely to change the way I treat a problem when other physical therapists I know are making changes. (Reversed)
6.	The opinions of respected practitioners should guide clinical practice. (Reversed)
8.	I am often critical of accepted physical therapy treatments.
11.	It is not a good idea to use treatments different from other physical therapists I know. (Reversed)
14.	My colleagues consider me to be someone who makes his own decisions about treatment.

Table 11

Items Measuring Practicality (Green et al., 2001) in the Factors Affecting the Propensity to Adopt Evidence-Based Practice Survey

15.	I don't have time to read up on every clinical decision. (Reversed)
16.	I follow practice guidelines if they are not too much of a hassle. (Reversed)
17.	I am too busy taking care of patients to keep up with the recent literature. (Reversed)
19.	I follow practice guidelines as long as they don't interfere too much with the flow of patients. (Reversed)

The second section of the survey was from a short version of the DLOQ (Watkins & Marsick, 1998; Yang et al., 2002). No reverse coding was necessary for these scales.

The items measured in each scale are listed in the following tables: Table 12, *continuous learning*; Table 13, *dialogue & inquiry*; Table 14, *team learning*; Table 15, *embedded systems*, Table 16, *empowerment*; Table 17, *system connection*; and Table 18, *provide leadership*.

Table 12

Items Measuring Continuous Learning from the short form of the DLOQ (Watkins & Marsick, 1998; Yang et al., 2002) in the Factors Affecting the Propensity to Adopt Evidence-Based Practice Survey

20.	In my workplace, people help each other learn.
21.	In my workplace, people are given time to support learning.
22.	In my workplace, people are rewarded for learning.

Table 13

Items Measuring Dialogue & Inquiry from the short form of the DLOQ (Watkins & Marsick, 1998; Yang et al., 2002) in the Factors Affecting the Propensity to Adopt Evidence-Based Practice Survey

23.	In my workplace, people give open and honest feedback to each other.
24.	In my workplace, when people state their view, they also ask what others think.
25.	In my workplace, people spend time building trust with each other.

Table 14

Items Measuring Team Learning from the short form of the DLOQ (Watkins & Marsick, 1998; Yang et al., 2002) in the Factors Affecting the Propensity to Adopt Evidence-Based Practice Survey

26.	In my workplace, teams/groups have the freedom to adapt their goals as needed.
27.	In my workplace, teams/groups revise their thinking as a result of group discussions or information collected.
28.	In my workplace, teams/groups are confident that the organization will act on their recommendations.

Table 15

Items Measuring Embedded Systems from the short form of the DLOQ (Watkins & Marsick, 1998; Yang et al., 2002) in the Factors Affecting the Propensity to Adopt Evidence-Based Practice Survey

29.	My workplace creates systems to measure gaps between current and expected performance.
30.	My workplace makes lessons learned available to all employees.
31.	My workplace measures the results of the time and resources spent on training.

Table 16

Items Measuring Empowerment from the short form of the DLOQ (Watkins & Marsick, 1998; Yang et al., 2002) in the Factors Affecting the Propensity to Adopt Evidence-Based Practice Survey

32.	My workplace recognizes people for taking initiative.
33.	My workplace gives people control over the resources they need to accomplish their work.
34.	My workplace supports people who take calculated risks.

Table 17

Items Measuring System Connection from the short form of the DLOQ (Watkins & Marsick, 1998; Yang et al., 2002) in the Factors Affecting the Propensity to Adopt Evidence-Based Practice Survey

35.	My workplace encourages people to think from a global perspective.
36.	My workplace works together with the outside community to meet mutual needs.
37.	My workplace encourages people to get answers from across the organization when solving problems.

Table 18

Items Measuring Provide Leadership from the short form of the DLOQ (Watkins & Marsick, 1998; Yang et al., 2002) in the Factors Affecting the Propensity to Adopt Evidence-Based Practice Survey

38.	In my workplace, leaders mentor and coach those they lead.
39.	In my workplace, leaders continually look for opportunities to learn.
40.	In my workplace, leaders ensure that the organization's actions are consistent with its values.

The third section was a short form of the SDRLSNE (Fisher et al. 2001). No reverse coding was necessary for these scales.

The items measured in each scale are listed in the following tables: Table 19, *self-management*; Table 20, *desire for learning*; and Table 21, *self-control*.

Table 19

Items Measuring Self-management from the short form of the SDLRSNE (Fisher et al., 2001) in the Factors Affecting the Propensity to Adopt Evidence Based-Practice Survey

41.	I manage my time well.
42.	I am self-disciplined.
43.	I am organized.
44.	I set strict time frames.
45.	I have good management skills.
46.	I am methodical.
47.	I am systematic in my learning.
48.	I set specific times for my study.
49.	I solve problems using a plan.
50.	I prioritize my work.

Table 20

Items Measuring Desire for Learning from the short form of the SDLRSNE (Fisher et al., 2001) in the Factors Affecting the Propensity to Adopt Evidence Based-Practice Survey

51.	I want to learn new information.
52.	I enjoy learning new information.
53.	I have a need to learn.
54.	I enjoy a challenge.
55.	I enjoy studying.
56.	I critically evaluate new ideas.

Table 21

Items Measuring Self-control from the short form of the SDLRSNE (Fisher et al, 2001) in the Factors Affecting the Propensity to Adopt Evidence-Based Practice Survey

57.	I prefer to set my own goals.
58.	I like to make decisions for myself.
59.	I am responsible for my own decisions/actions.
60.	I am in control of my life.
61.	I have high personal standards.
62.	I prefer to set my own learning goals.

Cronbach's alpha was assessed to measure how well the items in each construct measured a single unidimensional variable. Table 22 depicts the distribution and reliability of scale variables of the key measures in the instrument *Factors Affecting the Propensity to Adopt Evidence-Based Practice*.

The next step in data preparation was to examine the intercorrelation between the scale scores. Each independent variable was regressed on all other independent variables. No coefficients were .80 or larger. Therefore, it was concluded that multicollinearity was not a problem (Lewis-Beck, 1980). Appendix F depicts the intercorrelation between scale items.

Table 22

Distribution and Reliability of the Scale Variables

	n of items	*M*	*SD*	*M* of items	Coefficient Alpha
Dependent Variable					
Propensity to adopt EBP using the evidence vs. experience scale	8	31.9	6.1	4.0	.83
Personal Characteristics					
Self-management	10	44.7	6.9	4.5	.87
Desire for learning	6	30.9	3.9	5.2	.85
Self-control	6	31.9	3.2	5.3	.80
Nonconformity	6	23.7	3.7	4.0	.56
Practicality	4	14.1	3.8	3.7	.66
DLOQ Variables					
Continuous learning	3	12.9	3.4	4.3	.79
Dialogue & inquiry	3	13.6	3.2	4.5	.87
Team learning	3	12.5	3.3	4.3	.81
Embedded systems	3	10.7	3.5	3.6	.79
Empowerment	3	11.5	3.4	3.8	.81
System connection	3	12.3	3.3	4.1	.80
Provide leadership	3	12.8	3.7	4.2	.89

Description of Respondents

The majority of the respondents were female (72.7%). Males represented 27.3% of the respondents. The majority of the participants were white (86.1%), 6.1% were Asian, 4.6% were Black/African American, and 1.1% of the respondents were Hispanic. Native Hawaiians and other pacific Islanders represented only 0.4% and American Indian/Alaska Natives represented only 0.1%. “Other” was marked by 1.7 % of the respondents. A list of “other” races is listed in Appendix G. With respect to the highest degree earned, 53.2% of the respondents held a bachelor’s degree, 42.4 % held a master’s degree, only 1.4% held a doctorate in physical therapy, 1.8% held other doctorates, and 1.2 marked “other.” A list of “other” degrees can be found in Appendix H. With respect to employment setting, 41% were employed in the outpatient setting, 20.8% in a hospital, 12% by a home health agency, and 7.2% by a skilled nursing

facility/extended care facility or assisted living facility, 3.6% by a school system, 1.8% in an academic institution, 4.3% by an acute rehab or sub-acute rehab hospital, 3.7% marked "other," and 5.4% listed multiple places of employment. See Appendix I for a list of "other" places of employment. The majority of respondents spent most of their work time in direct patient care, (mean = 77.5 %), 13.4 % (mean) of their time was spent in administration, 5.7 % (mean) in education, 1.4% (mean) in research and 2% (mean) of their time was marked "other." See Appendix J for a list of "other" time spent during work. The respondents ranged in age from 24 to 80, with a mean age of 39.4 years. The respondents' period of time as a licensed physical therapist ranged from two months to 55 years, with a mean of 13.4 years. See Table 23 for a summary of the personal characteristics of the respondents.

Table 23

Personal Characteristics of Study Respondents (n = 831)

Variable	Value
Age	*M* = 39.4, *SD* = 9.5
Years as a licensed physical therapist	*M* = 13.4, *SD* = 9.8
Gender	
Female	72.7%
Male	27.3%
Race/Ethnicity	
White/Caucasian	86.1%
Asian	6.1%
Black/African American	4.6%
Hispanic	1.1%
Native Hawaiian and other Pacific Islander	0.4%
American Indian/Alaska Native	0.1%
Other	1.7%
Highest degree held	
Bachelor's	53.2%
Master's	42.4%
Doctorate in Physical Therapy	1.4%
Other Doctorate	1.8%
Other	1.2%
Employment setting	
Outpatient	41%
Hospital	20.8%

Table 23 (continued)

Personal Characteristics of Study Respondents (n = 831)

Variable	Value
Home Health Agency	12%
Skilled Nursing Facility/Extended Care/ Assisted Living Facility	7.2%
Acute Rehab or Sub-acute Rehab Hospital	4.3%
School System	3.6%
Academic Institution	1.8%
Other	3.7%
Multiple listings	5.4%
Percentage of time respondents spend performing selected activities	
Direct Patient Care	*M* = 77.5%, *SD* = 22.6
Administration	*M* = 13.4%, *SD* = 18.5
Education	*M* = 5.7%, *SD* = 10.6
Research	*M* = 1.4%, *SD* = 5.9
Other	*M* = 2%, *SD* = 6.6

The respondents were similar in age, years licensed as a physical therapists, gender, and race to the physical therapists described in the survey, *Georgia's Workforce 2001* (2001). This study had a higher response rate from physical therapists with a master's degree (*n* = 42.4%) than the *Georgia's Workforce 2001* (*n* = 18.4%). The discrepancy in degree may have represented a response bias in which individuals with higher degrees were more apt to respond to the survey. The respondents in this study also had a higher number of respondents employed in the outpatient setting (*n* = 41%) as opposed to the *Georgia's Workforce 2001* (*n* = 20.6%). See Table 24 for comparison.

Data Analysis

SPSS was used for all data analysis. Research question number one, "To what extent do personal characteristics predict the propensity to adopt evidence-based practice?" *required examination of bivariate relationships between the predictor variables, personal characteristics;* self-management, desire for learning and self-control, *three scales for self-*

directed learning from the SDLRSNE (Fisher et al., 2001); nonconformity *and* practicality, *two scales from the Green et al. (2001) instrument; and selected background variables;* age, years licensed as a physical therapist, percentage of time spent in direct patient care, *and* percentage of time spent in administration *and the dependent variable,* propensity to adopt EBP. When

Table 24

Personal Characteristics of Study Respondents Compared to Georgia Physical Therapy Work Force 2001

Variables	Respondents (n = 831)	Georgia Physical Therapy Workforce 2001 (*n* = 3,195)
Age	*M* = 38.8	*M* = 39.4
Years licensed as a physical therapists	*M* = 13.4	*M* = 13.7
Year original licensed was issued (Georgia Physical Therapy Workforce 2001 actual question)		
Gender		
Female	72.7%	74.5%
Male	27.3%	25.5%
Race		
White/Caucasian	86.1%	83.7%
Asian	6.1%	7.7%
Black/African American	4.6%	6.6%
Hispanic	1.1%	1.1%
Native Hawaiian/ Pacific Islander	0.4%	Not reported
American Indian/Alaska Native	0.1%	0.1%
Other	1.7%	0.8%
Highest degree held		
Bachelor's	53.2%	75.5%
Masters	42.4%	18.4%
Doctorate in physical therapy	1.4%	0.2%
Other Doctorate	1.8%	Not reported
Employment setting		
Outpatient	41%	20.6%
Hospital	20.8%	24.6%
Home Health Agency	12%	Not reported
Skilled Nursing Facility/Assisted Living Facility	7.2%	8.8%
Acute Rehab or Sub-acute Rehab Hospital	4.3%	6.1%
School System	3.6%	4.0%
Academic Institution	1.8%	Not reported
Other	3.7%	35.9%

variables were measured at the interval level as were all the scale variables, a simple linear regression was run. When the variable was ordinal which was the case with one variable, *highest degree held,* a Spearman correlation was run. In the one case where the predictor variable was dichotomous (*gender*) an independent t-test was conducted.

Research question number two, "To what extent do the characteristics of the social system in the workplace predict the propensity to adopt evidence-based practice?" required the examination of bivariate relationships between the seven independent variables from the short version of the DLOQ (Watkins & Marsick, 1998; Yang et al., 2002); *continuous learning, dialogue and inquiry, team learning, embedded system, empowerment, system connection,* and *provide leadership* and the dependent variable, *propensity to adopt EBP,* from the evidence versus experience scale of the modified Green et al. (2001) instrument.

Research question number three, "To what extent do a combination of personal characteristics and the characteristics of the social system in the workplace predict the propensity to adopt evidence-based practice?" required multiple regression analysis to determine to what extent personal characteristics which included: the three scales for self-directed learning from the SDLRSNE (Fisher et al., 2001) (*self-management, desire for learning, and self- control*), the two scales from the Green et al. (2001) instrument (*nonconformity* and *practicality*) and selected background variables (*age, years licensed as a physical therapist, percentage of time spent in direct patient care, and percentage of time spent in administration*) and the seven dimensions of the learning organization (*continuous learning, dialogue and inquiry, team learning, embedded system, empowerment, system connection,* and *provide leadership*) as described in the short version of the DLOQ (Watkins & Marsick, 1998; Yang et al., 2002) jointly explained the

observed variance in the propensity to adopt EBP from the subscale evidence versus experience from the modified Green et al. (2001) instrument.

Chapter Summary

This chapter described the conceptual framework, research paradigm, instrumentation, sample, data collection, data preparation, and data analysis of a study that predicted the personal characteristics and characteristics of the social systems in the workplace that influence the propensity to adopt EBP. Despite the call for the shift in the paradigm from physical therapy practice based on expert opinion, clinical experience, and intuition to practice based on examinations and interventions that are backed by client centered research and other scientific studies (American Physical Therapy Association, 2000; Blood et al., 2000; Duncan, 1996; Rothstein, 1997, 2000, 2001), there has been little research to determine the factors that influence physical therapists to adopt EBP. The survey instrument constructed for this study was designed to determine the extent to which personal characteristics, selected background characteristics, and the characteristics of social systems in the workplace are related to the *propensity to adopt EBP*.

CHAPTER 4

RESEARCH FINDINGS

The purpose of this study was to determine to what extent individual factors and the characteristics of the social system in the workplace influence the propensity of physical therapists to adopt evidence-based practice. The study was guided by the following questions:

1. To what extent do personal characteristics predict the propensity to adopt evidence-based practice?
2. To what extent do the characteristics of the social system in the workplace predict the propensity to adopt evidence-based practice?
3. To what extent do a combination of personal characteristics and the characteristics of the social system in the workplace predict the propensity to adopt evidence-based practice?

All data analysis was done using *SPSS.* Data were prepared by cleaning the data, creating the scale scores, and calculating the reliability for each of the scales on each of the measures using coefficient alpha. Next, the answers to the research questions were sought by conducting linear regression, a Spearman correlation, and independent t-test and multiple regression analyses. Findings will be presented by research question.

Findings Related to Research Question # 1

The first research question asked, “To what extent do personal characteristics predict the propensity to adopt evidence-based practice?” Simple linear regression examined the extent to which nine predictor variables predicted the outcome variable, *propensity to adopt EBP*. These

included: *self-management, desire for learning, self-control, nonconformity, practicality,* and selected background variables of *age, years licensed as a physical therapist, percentage of time spent in direct patient care, and percentage of time spent in administration.* Additionally, coefficients of determination (r^2) were calculated to determine the proportion of variance in the dependent variable explained by personal characteristics. One variable, *highest degree earned,* was ordinal and was analyzed using the Spearmen Correlation coefficient. *Gender* was dichotomous and was analyzed using a t-test to compare means.

Most of the personal characteristics were predictors of the *propensity to adopt EBP*. However, generally speaking the amount of observed variance was small. The only predictor that was a substantive predictor was *desire for learning*. Out of the nine variables tested, eight were statistically significant at the .05 level or better. The strongest correlation was a subscale of self-directed learning, *desire for learning* (r = .36, r^2 = .13). The other two subscales of self-directed learning, *self-control* (r = .18, r^2 = .03), and *self-management* (r = .09, r^2 = .01) contributed less to the variance in the propensity to adopt EBP. *Practicality* (r = .27, r^2 = .07) and *nonconformity* (r = .24, r^2 = .06) contributed significantly to the variance in the propensity to adopt EBP. The observed variance in all the other variables was so low that they are potentially unimportant. Table 25 contains the results of this analysis.

A t-test revealed there was a statistically significant *gender* difference with respect to *propensity to adopt EBP* as measured by the evidence versus experience scale from Green et al. (2001) (t = -4.601, df = 800, p =. 05). The mean for females was 31.33 (SD = 6.08) and for males was 33.55 (SD = 5.98). The average per item mean for males was 4.90 and 3.91 for females. Generally speaking males and females both demonstrated a *propensity to adopt EBP* as measured by the evidence versus experience scale from Green et al. Males agreed more strongly

than females that “evidence is the best source of knowledge about what constitutes good practice as opposed to clinical experience and authority” (Green et al., 2001, p. 5). A Spearman correlation test demonstrated a significant relationship at the .05 level between *highest degree held* and *the propensity to adopt EBP* as measured by the evidence versus experience scale from Green et al. ($r_s = .29$, $r^2 = .08$).

Table 25

Simple Regression of Personal Characteristics Predicting the Propensity to Adopt EBP

Variable	*r*	r^2	*p*
Desire for learning	.36	.13	.001
Practicality	.27	.07	.001
Nonconformity	.24	.06	.001
Self-control	.18	.03	.001
Years licensed as a physical therapist	-.10	.01	.002
Self-management	.09	.01	.006
Age	-.07	.01	.026
Percentage of time spent in direct patient care	-.07	.01	.025
Percentage of time spent in administration	-.04	.00	.114

Findings Related to Research Question # 2

Research question two asked, “To what extent do the characteristics of the social system in the workplace predict the propensity to adopt evidence-based practice?” Simple linear regression was used to predict the extent each of the seven dimensions of the learning organization predicted *the propensity to adopt EBP* as measured by the subscale evidence versus experience from the Green et al. (2001) instrument. The seven dimensions of the learning organization included: c*ontinuous learning, dialogue and inquiry, team learning, embedded systems, system connection, empowerment,* and *provide leadership. Continuous learning, empowerment,* and *system connection* were significant at the .03 level or better. *Dialogue and inquiry, team learning, embedded systems,* and *provide leadership* were not significant at the .05

level. *Empowerment* (r = .11, r^2 = .01), *continuous learning* (r = .08, r^2 = .01), and *system connection* (r = .08, r^2 = .01) made minimum contributions to the observed variance in the propensity to adopt EBP. However, these findings are so low as to probably not represent substantial importance. Table 26 contains the results of this analysis.

Table 26

Simple Regression of Dimensions of the Learning Organization (Watkins & Marsick, 1998) Predicting the Propensity to Adopt EBP

Variable	*r*	r^2	*p*
Empowerment	.11	.01	.001
Continuous learning	.08	.01	.015
System connection	.08	.01	.012
Team learning	.06	.003	.062
Provide leadership	.04	.002	.109
Embedded systems	.04	.002	.123
Dialogue & inquiry	.03	.001	.233

Findings Related to Research Question # 3

Research question three asked, "To what extent do a combination of personal characteristics and the characteristics of the social system in the workplace predict the propensity to adopt evidence-based practice?" Research question three represented an attempt to build the "best model." In order to answer question three, forward selection method was selected. The forward selection method was used to find the best one variable model, the best two variable model, and the best three variable model. An attempt to build a four variable model added only negligible amounts of variance (<1%).

In a quest to build the best model, the computer chose the best model based the best observed variances. Loading in 18 predictor variables began the process. The variables loaded included: *self-management, desire for learning, self-control, nonconformity, practicality, age,*

years licensed as a physical therapist, percentage of time spent in direct patient care, percentage of time spent in administration, gender, highest degree held, c*ontinuous learning, dialogue and inquiry, team learning, embedded system, system connection, empowerment,* and *provide leadership.*

Desire for learning significantly predicted the *propensity to adopt EBP p* =.05, R^2 = .14. These findings indicated that approximately 14% of the variance of the *propensity to adopt EBP* was predicted by the measures included in the *desire for learning* scale from the *SDLRSNE* (Fisher et al., 2001). See Table 27 for a summary of the best one variable model.

Table 27

Best One Variable Model

Variable	Beta	*t*	*p*
Desire for Learning	.369	10.465	.05

Note. Model Statistics: R^2 = .14, *F* = 109.521, *df* =1, 695, *p* = .05

The best two variable model depicted in Table 28 consisted of d*esire for learning* and *highest degree held.* Adding a second variable accounted for 19% of the observed variance of the *propensity to adopt EBP p* = .05, R^2 = .19. Indicating approximately 19% of the variance of the propensity to adopt EBP was accounted for by the measures in the *desire for learning* scale and *the highest degree held*.

The three variable model depicted in Table 29, consisted of *desire for learning, highest degree held, and practicality.* Adding the third variable accounted for 23% of the variance in the *propensity to adopt EBP p* = .05, R^2 = .23, indicating approximately 23% of the variance in the

propensity to adopt EBP is accounted for by the measures in *desire for learning*, and *practicality* scales and *the highest degree held*.

Table 28

Best Two Variable Model

Variable	Beta	*t*	*p*
Desire for learning	.333	9.674	.05
Highest degree held	.241	7.000	.05

Note: Model Statistics: R^2 = .19, F = 83.046, df = 2, 694, p = .05

Table 29

Best Three Variable Model

Variable	Beta	*t*	*p*
Desire for learning	.282	8.010	.05
Highest Degree held	.236	6.967	.05
Practicality	.187	5.358	.05

Note: Model Statistics: R^2 = .23, F = 67.146, df = 3, 693, p = .05

The addition of the other 15 variables did not significantly improve the predictive power of the model. These analyses suggested that the most useful predictors for the *propensity to adopt EBP* were *desire for learning, highest degree held,* and *practicality.* In this sample population self-directed learning as measured by the self-management and self-control scales, the social system in the workplace as measured by the DLOQ (Watkins & Marsick, 1998; Yang et al. 2002), *age*, *number of years licensed as a physical therapist*, and *activities engaged in during*

the workday made minimal contributions to the observed variance in the *propensity to adopt EBP*.

In addition, in an effort to identify the predictive power of interactions between variables, degree was treated as a cross product of each of the other independent variables.

All cross product terms were examined as additional variables and loaded with *self-management, desire for learning, self-control, nonconformity, practicality, age, years licensed as a physical therapist, percentage of time spent in direct patient care, percentage of time spent in administration, gender, highest degree held, continuous learning, dialogue and inquiry, team learning, embedded system, system connection, empowerment,* and *provide leadership*.

In the final analysis the cross products were of no statistical significance. A fully saturated model was not tested because the sample size was not large enough to support additional variables.

CHAPTER 5

DISCUSSION OF FINDINGS

The purpose of this chapter is to interpret the findings presented in Chapter Four. This chapter is divided into eight major sections: study summary, discussion of the findings, implications for practice, implications for theory, suggestions for future research, limitations of the study, chapter summary, and conclusions.

Study Summary

This study gathered data from a random sample of physical therapists licensed by the state of Georgia. The study concentrated on identifying the propensity to adopt evidence-based practice among licensed physical therapists. The purpose of this study was to determine to what extent individual factors and the characteristics of the social system in the workplace influence the propensity of physical therapists to adopt evidence-based practice. The study was guided by the following questions:

1. To what extent do personal characteristics predict the propensity to adopt evidence-based practice?
2. To what extent do the characteristics of the social system in the workplace predict the propensity to adopt evidence-based practice?
3. To what extent do a combination of personal characteristics and the characteristics of the social system in the workplace predict the propensity to adopt evidence-based practice?

A composite survey instrument, *Factors Affecting the Propensity to Adopt Evidence Based Practice*, was developed to specifically address these three research questions. The survey instrument gathered information from physical therapists licensed by the state of Georgia on their *propensity to adopt EBP*, personal characteristics, characteristics of the social system of their workplace, and selected background variables. The composite instrument was created from three sources: a *Psychometric Instrument* developed by Green et al. (2001), the short version of the *Dimensions of the Learning Organization* (Watkins & Marsick, 1998; Yang et al., 2002), and a shortened *Self-directed Learning Readiness Scale for Nurse Education* (Fisher et al., 2001). The development of the instrument included: (1) clarification of the concept of EBP, (2) location and critique of existing instruments for EBP, (3) adaptation of the Green et al. instrument, (4) expert panel review of the adapted instrument, (5) revision of the questions by the methodologists, (6) location and critique of existing instruments for self-directed learning, (7) selection and shortening of the SDLRSNE (Fisher et al.), (8) location and critique of the DLOQ (Watkins & Marsick, 1998), (9) location, critique, and selection of the shortened DLOQ (Watkins & Marsick, 1998; Yang et al.), (10) addition of background items, (11) pretest of the instrument, (12) final review and modification of the instrument, and (13) construction of the final survey instrument.

The sample used for this study was a random sample of physical therapists licensed by the state of Georgia. The random sample of 1,320 physical therapists was selected from a database of 3,897 physical therapists licensed by the state of Georgia.

A three-step process was used to distribute the survey instrument: (1) a cover letter and survey instrument were mailed, (2) ten days later a post card reminder was mailed to

nonrespondents to encourage them to complete the survey instrument, (3) thirty five days after the initial mailing a different cover letter and survey instrument were mailed.

Nine hundred and thirty nine surveys were returned for a response rate of 73%. Eight hundred and thirty one surveys were useable. Data were entered into a *Microsoft* spreadsheet. After cleaning the data and checking it for errors it was transferred to SPSS *11.5* database. The statistical analysis included: reliability of scales, frequencies, simple linear regression, Spearman correlation, t-test, and stepwise multiple regression.

Discussion of Findings

This study tested a model that suggested three classes of predictor variables for the *propensity to adopt EBP*: personal characteristics, characteristics of the social system in the workplace, and selected demographic variables. *Propensity to adopt EBP* was defined as a preference toward the belief that "scientific evidence is perceived as the best source of knowledge about what constitutes good practice as opposed to clinical experience and authority" (Green et al., 2002, p. 5). In other words, the personal characteristics, characteristics of the social system of the workplace, and selected demographic variables predicted a general attitude toward adopting EBP, however, they were not actual predictors of behavior. The results of the model tested that predicted the *propensity to adopt EBP* have been depicted in Figure 4.

Findings Related to Research Question # 1

Linear regression was used to answer the question: "To what extent do personal characteristics predict the propensity to adopt evidence-based practice?" The predictive power of eleven variables on the *propensity to adopt EBP* was examined. Among the predictors *desire for learning*, *practicality*, and *nonconformity* had a moderate level of predictive power, predicting the *propensity to adopt EBP*. *Highest degree held* was ordinal and was measured using a

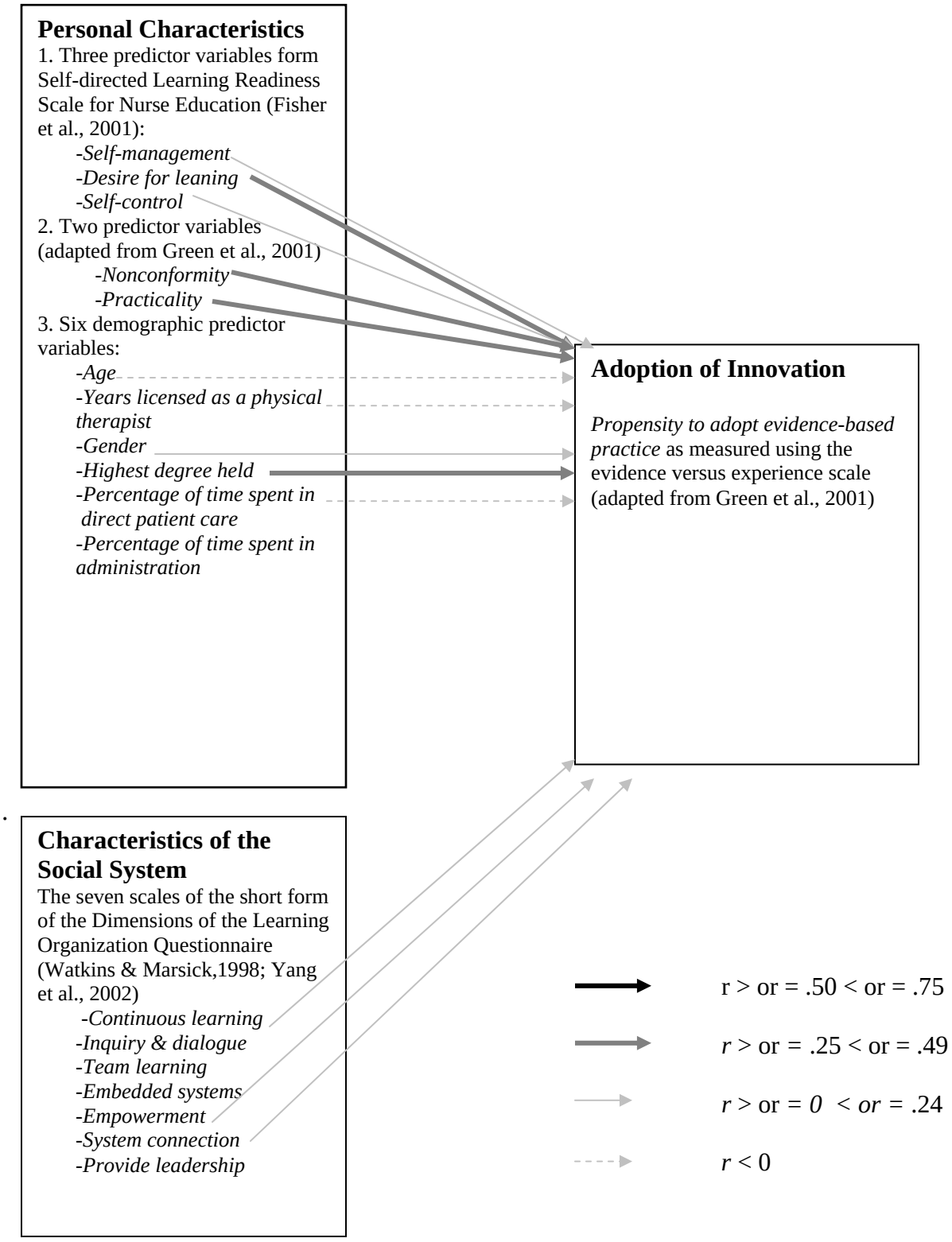

Figure 4. The results of the model tested that predicted the *propensity to adopt EBP*.

Spearman correlation. *Highest degree held* demonstrated a moderate level of predictive power. *Gender* was a modest predictor of the *propensity to adopt EBP*. *Age, years licensed as a physical therapist*, and *time spent in direct patient care* were negatively correlated with the *propensity to adopt EBP*.

Desire for Learning

In the bivarate analyses, the strongest relationship was between *desire for learning* and *propensity to adopt EBP* (r = .36, r^2 = .13). This is intuitively understandable. At the present time physical therapists do not have secondary resources that summarize research evidence. It is the responsibility of each individual physical therapist to develop questions on each clinical problem and critically appraise research studies for the level of research evidence. The items included in the scale *desire to learn* report an individual's perception of desire to learn new information, enjoyment of learning new information, having a need to learn, enjoying a challenge, enjoying studying, and critically evaluating new ideas. The next section will discuss how these characteristics interface with the process currently taught to physical therapists to carry out EBP previously described as PICO (Forrest, 2001). There are four essential steps involved in the PICO process:

1) Based on a problem from practice, the physical therapist formulates an answerable question.
2) The physical therapist searches for and obtains the relevant research evidence needed to answer the question.
3) The physical therapist critically appraises the evidence.

4) The physical therapist then makes clinical decisions based on integrating the research evidence with clinical experience and the patient's values and assesses the outcome (Forrest, 2001; Lusardi, LeVangie, & Fein, 2002; Sackett, et al., 2000).

In EBP in physical therapy, the patient is the source of the development of a clinically relevant question. In the encounter with the patient, the physical therapist identifies the patient's key problem. A clinical question is formulated that summarizes the problem. Formulation of the question in the complex messy world of day-to-day practice calls forth many of the skills and processes of self-directed learning of which *desire for learning* is a component. A fully self-directed learner is one who has learned to think critically (Brookfield, 1985; Garrison, 1997) It is the critical reflection on one's practice that forms the basis for developing a clinical question for clinical decision making based on research evidence (Ebell, 1999). Therefore, it is understandable that a correlation was demonstrated between the *desire for learning* scale and the *propensity to adopt EBP* in which one of the items addressed critical evaluation of new ideas. Developing a question also requires other behaviors identified as characteristics of the self-directed learner in the literature: initiative (Gugliemino, 1977; Knowles, 1975); self-discipline (Candy, 1991; Guglielmino, 1977); openness and motivation (Candy, 1991); and the ability to develop and set goals (Knowles, 1975). Initiative and self-discipline were consistent with the behaviors described in the *self-management* scale, which emerged as a minimal predictor of the *propensity to adopt EBP*. Goal setting was addressed in two of the items in the *self-control* scale, which emerged as a minimum predictor of the *propensity to adopt EBP*.

I speculate that *desire for learning* emerged as the strongest predictor because adults learn best when the topic is of immediate value and relevance (Fraser & Greenhalgh, 2001; Knowles, 1975). In EBP we see the natural teaching method described by Osler (1906)

emanating from the patient who has a problem for which the physical therapist has developed a question. The patient is the source of the physical therapist's inquiry. Out of the physical therapist's *desire to learn* the physical therapist seeks the best treatment intervention based on the best current research evidence available. This is consistent with the charter that Meizrow (1981) developed for the purpose of facilitating the development of adults as self-directed learners. He postulates that learning should be centered around personal problems, which in the context of EBP is the patient the physical therapist is currently examining.

The physical therapist then searches for and collects relevant research evidence to answer the problem. I speculate that the forces that drive physical therapists to seek answers to problems are also responsible for the correlation between *desire to learn* and the *propensity to adopt EBP*. Physical therapists are fueled by anxiety that is based on the deficiency in understanding the problem and the curiosity associated with the desire to know the answer (Richards, 1986). Three items in the *desire to learn* scale address these behaviors, "I want to learn new information, I have a need to learn, and I enjoy a challenge."

Next the physical therapist critically appraises the evidence. The item, "I critically evaluate new ideas," is consistent with critical appraisal of the literature. Critical appraisal is essential for physical therapists at this time to determine the level of evidence for a diagnostic test or therapeutic intervention. It can be extrapolated that individuals who perceive that they critically evaluate new ideas will critically evaluate their practice based on the best current research evidence available. In other words, they will have a preference toward the belief that "scientific evidence is the best source of knowledge about what constitutes good practice as opposed to clinical experience and authority" (Green et al., 2002, p. 5). Critical appraisal of the literature requires skills in statistical analysis that may have been obtained in higher-level

education. In the final step of the PICO process the physical therapist makes clinical decisions based on integrating the research evidence with the patient's values and assesses the outcome (Forrest, 2001). This heavy workload of carrying out the PICO process demands that a physical therapist have a *desire to learn*.

Highest Degree Held

Level of education attainment as described by *highest degree held* was a moderate predictor of the *propensity to adopt* EBP. Using the Spearman correlation there was a significant relationship between the *highest degree held* and the *propensity to adopt EBP* ($r_s = .29$, $r^2 = .08$). This study provides empirical evidence that the higher the degree of education physical therapists obtain the more likely they are to demonstrate the *propensity to adopt EBP*. This finding is consistent with previous research by Warren and Pierson (1994) who found that physical therapy students with a master's degree demonstrated a more positive attitude toward research than baccalaureate students. Further, the study findings are in keeping with the criteria for accreditation of physical therapy programs at the master's level. Graduates must be able to "evaluate published studies related to physical therapy practice, research and education" (Commission on Accreditation in Physical Therapy, p. 21, criteria 3.8.3.10). The findings of this study are also consistent with the study by Connolly et al. (2001). The findings by Connolly et al. substantiate change in student values to research evidence over traditional protocols after taking a research course. Similarly, the report by Jette et al. (2003) validates that higher degree attainment is related to physical therapists' beliefs that they have the knowledge necessary to carry out the PICO process. The findings of this study suggests the degree of emphasis on research skills and critical appraisal skills are different between a baccalaureate degree, a master's degree, and a doctorate degree and it is the research coursework undertaken by an

individual that influences their *propensity to adopt EBP*. However, without knowledge of the research coursework of physical therapists in the present study, it can only be speculated that the emphasis on research and critical appraisal skills in master's and doctorate level programs influenced physical therapists' *propensity to adopt EBP*.

Age and Years Licensed as a Physical Therapist

Although the observed variance in *age* and *years licensed as a physical therapist* were so low as to be potentially unimportant as predictors, they proved useful when studied with the predictor *highest degree held*. *Age* (r = -.07, r^2 = .01) and *years licensed as a physical therapist* (r = -.10, r^2 = .01) were negatively correlated with the *propensity to adopt EBP*. I extrapolated that physical therapists that were older and have been licensed longer were less likely to demonstrate the *propensity to adopt EBP* because they were not exposed to the value of scientific studies in an undergraduate curriculum. Jette et al. (2003) found physical therapists report of education, knowledge, and skills in EBP were associated with age, years since licensure, and advanced level degrees. However, since the interaction terms of *highest degree held* and *age* and *highest degree held* and *years licensed as a physical therapists* were not statistically significant, extrapolation must be handled by logical rather than statistical inference.

Time Spent in Direct Patient Care

Time spent in direct patient care was also potentially so low as to be insignificant. However, because of the negative correlation it is noteworthy. Based on the findings of this study those who are providing direct patient care do not value "scientific studies, as the best source of knowledge about what constitutes good practice" (Green et al., 2002, p. 5) but rather value clinical experience and authority in making clinical decisions. This means direct patient care continues to be based clinical experience and authority. Reaching the provider of direct

patient care is imperative if the paradigm is going to shift from practice based on tradition. unsystematic clinical experience, intuition, and the opinions of experts (Duncan, 1997; Evidence based Medicine Working Group, 1992; Kessenich et al., 1997) to practice based on "the integration of best research evidence with clinical experience and patient values"(Sackett et al. 2000, p.1).

Practicality

In the bivarate analysis, *Practicality* (r = .27, r^2 = .07) accounted for 7 % of the separate effects that predicted the *propensity to adopt EBP*. Numerous authors have cited lack of time as a barrier to the adoption of EBP (Bury, 1998; Closs & Lewin, 1998; Jette, 2003). It is therefore not surprising that physical therapists, who reported that they agreed that evidence-based guidelines and scientific studies can be used to make clinical decisions in the day-to-day practice of physical therapy without interfering with productivity or the smooth and orderly flow of patients (Green et al., 2001), would predict the *propensity to adopt EBP*.

Nonconformity

Using bivarate analysis, *Nonconformity* (r = .24, r^2 = .06) accounted for 6% of the separate effects to predict the *propensity to adopt EBP*. The physical therapy profession has called for autonomous practice for physical therapists. The definition developed by the board of directors of the American Physical Therapy Association follows. "Autonomous physical therapist practice is characterized by independent, self-determined professional judgment and action. Physical therapists have the capability, ability, and responsibility to exercise professional judgment within their scope of practice, and to professionally act on the judgment" (Board of Directors Minutes, American Physical Therapy Association, 2001, p. 21). This study suggested that since physical therapy has matured as a profession from a position of performing a requested

procedure by prescription from doctors to an autonomous profession some physical therapists have shifted their beliefs to be consistent with the new image (Chassin, 1998; Swinkels et al., 2002). The study demonstrated that some physical therapists believed they were comfortable with engaging in clinical practices that are out of step with how others in the local community provide care or what opinion leaders recommend (Green et al., 2002). There was a relationship between physical therapists' view of themselves as a *nonconformist* and the *propensity to adopt EBP*. In other words, as physical therapists perceived themselves as having the capability, ability, and responsibility to exercise professional judgment, they concomitantly demonstrated a propensity to value research evidence over experience and authority when making clinical decisions. Thus, *nonconformity* at a moderate level separately predicted the *propensity to adopt EBP*.

Gender

A statistically significant *gender* difference was observed, with males agreeing more strongly (M = 33.55) than females (M = 31.33) that "scientific evidence is perceived as the best source of knowledge about what constitutes good practice as opposed to clinical experience and authority" (Green et al., 2002, p. 5). A qualitative study of gender related values (Raz, Jensen, Walter, & Drake, 1991) aided understanding. Ten female physical therapists were interviewed in depth. One of the major thematic categories identified was values, which consisted of the subcomponents of caring, relationship, empowerment, and context. The interviews revealed the high degree to which the female interviewees valued interpersonal relationships. Many of the interviewees described sensitivity and interpersonal relationship skills as their strongest attributes as physical therapists. Furthermore, the qualities of receptiveness and responsiveness were considered important components of the treatment intervention and sometimes critical to the

other health care needs of the patient. For example, one therapist reported that often times she had a physical therapy session in which “the person comes in and all we do is sit and talk, because that’s what they need” (subject 1 as cited in Raz et al., 1991, p. 534). This was consistent with the findings of Cafferella and Olson’s (1993) review of the literature on the psychosocial development of women. They found in a cross validation study that relationships and a sense of connectedness to others were of central importance to the overall developmental process throughout a woman’s lifespan (Cafferella & Olson, 1993). Further support for the importance of relationships in women’s lives comes from Belenky, Clinchy, Goldberger and Tarule (1997), who posited that more women than men define themselves by interpersonal relationships. I speculated that females may have valued clinical experience more than scientific studies when interpersonal relationships were considered as an integral part of the treatment intervention. Based on the qualitative study cited the female physical therapists believed caring affected the outcome of physical therapy treatment interventions (Raz et al., 1991). Therefore, it was not surprising that females only slightly agreed that “scientific evidence is perceived as the best source of knowledge about what constitutes good practice as opposed to clinical experience and authority” (Green et al., 2002, p. 5).

It is important to note here that the above explanations are purely speculative. In order to discover what is really going on, research that simultaneously examines the belief about treatment interventions and the belief about interpersonal relationships as a component of treatment interventions needs to be conducted. The focus should be on how beliefs about treatment interventions and beliefs about interpersonal relationships as a component of treatment interventions predict the *propensity to adopt EBP*.

The findings of Belenky et al. (1997) suggest another possibility for explaining the observed gender difference. They interviewed 135 women in depth. Belenky et al. found that more than half of the women interviewed were categorized as predominately subjectivist in their thinking. Subjective knowledge was defined as "a perspective from which truth and knowledge are conceived of as personal, private, and subjectively known or intuited" (Belenky et al., 1997, p. 15). Subjective thinkers were found in all social classes, ages, ethnic groups, and educational groups studied. Many of the subjective thinkers believed that every person has their own unique body of knowledge from experience that was as valid as the next persons (Belenky et al.). It is possible that women in the present study on *Factors Affecting the Propensity to Adopt Evidence-Based Practice in Physical Therapy*, who had reached the subjective knowledge stage, placed high value on their clinical experience. At this time a limited number of RCTs have been published on physical therapy interventions. When a subjective knower considered treatment interventions and the limited number of RCTs available, it is not surprising that she may have only slightly agreed "scientific evidence is perceived as the best source of knowledge about what constitutes good practice as opposed to clinical experience and authority" (Green et al., 2002, p. 5).

Findings Related to Research Question # 2

Linear regression was used to address the question "To what extent do the characteristics of the social system in the workplace predict the propensity to adopt evidence-based practice?" No substantial correlations were demonstrated between the seven dimensions of the learning organization and the *propensity to adopt EBP*. However, the findings of this study suggest *empowerment* ($r^2 = .01$), *continuous learning* ($r^2 = .01$), and *system connection* ($r^2 = .01$) modestly predicted *propensity to adopt EBP*.

The setting may have had an effect on *empowerment* emerging as more powerful than the other variables in the short form of the DLOQ (Watkins & Marsick, 1998; Yang et al., 2002) as modest predictors of the *propensity to adopt EBP*. The largest number of respondents (41%) worked in outpatient settings, which generally employ one to three physical therapists. The clinics are decentralized. Emphasis is placed on productivity. Furthermore, the physical therapists are encouraged to provide different treatment interventions as long as the physical therapists can provide a rationale for the intervention. Evidence based practice offers a scientific rationale to third party payers and will likely ensure reimbursement for physical therapy services rendered. Thus, it is understandable that *empowerment* emerged as a modest predictor of the *propensity to adopt EBP*.

It is not surprising that *system connection* emerged as a modest predictor of EBP. Physical therapy as a profession feels a strong responsibility to provide clinical education to physical therapy students. So strongly, that continuing education units are awarded to physical therapists that provide clinical education to students. Therefore, physical therapists report their workplace is connected to the environment. Supervising students forces physical therapists to stay up-to-date, consider the rationale for treatment interventions, question the students on the rationale for treatment interventions, and reflect themselves on the treatment interventions. These behaviors foster valuing the belief that "scientific evidence is perceived as the best source of knowledge about what constitutes good practice as opposed to clinical experience and authority" (Green et al., 2002, p. 5). Thus, it is understandable why *system connection* would emerge as a modest predictor of the *propensity to adopt EBP*.

Continuous learning also emerged as a modest predictor. What is surprising is that it did not account for a larger proportion of the observed variance in the *propensity to adopt EBP*.

Looking at one particular item of the *continuous learning* scale of the DLOQ (Watkins & Marsick, 1998; Yang et al., 2002), "people help each other learn," may elucidate the findings. The mean for this item was 4.97. Physical therapy as a profession values *continuous learning*, presently requiring 40 hours of continuing education biennially. However, what physical therapists learn may or may not be based on research evidence. A review of the course offerings on examination and treatment interventions offered by the Georgia chapter of the American Physical Therapy Association for the fall meeting may shed some light. "Experts" who have built a name nationally and internationally are scheduled to present the courses. There is no mention of the research evidence to support the examination and treatment interventions taught by the "experts." Evidence-based practice is an important paradigm shift that uses the strongest and most appropriate study design for the question being studied rather than expert opinion, tradition, intuition, unsystematic clinical experience, and pathophysiological rationale (Bennett & Bennett, 2000; Evidence Based Working Group, 1992; Kessenich et al., 1997). For physical therapy interventions RCTs, meta-analyses, and systemic reviews provide a higher level of evidence than cohort studies, which in turn, are more valid than case series, case studies, expert opinion, and pathophysiolologic reasoning (Ebell & Shaughnessy, 2003). "Experts" recommendations may not be based on the best available evidence. An evidence-based approach to presenting continuing education would consist of looking at all the evidence on the topic presented, rating the quality of studies, and then basing the treatment intervention on the best evidence (Ebell & Shaughnessy, 2003). The goal of continuing education is not solely to increase knowledge and skills of physical therapy techniques. Rather, it should be to improve patient outcomes by encouraging physical therapists to change their practice based on the best current research evidence available (Ebell & Shaughnessy, 2003). This is the expectation for practice

for physical therapists set forth by the American Physical Therapy Association in V*ision 2020*: "physical therapists and physical therapy assistants will render evidence-based service throughout the continuum of care and improve quality of life for society…." (American Physical Therapy Association, 2003, HOD06-00-24-35, para.3).

Physical therapists attend courses based on the opinion of "experts" and return to their respective workplaces eager to share the knowledge and skills they have learned with other staff members. Therefore, they report they "help each other learn." Thus, I speculate that the lack of substantial correlation between *continuous learning* and the *propensity to adopt EBP* was related to the gap between espoused theory and theory-in-use (Argyris & Schön, 1978).

Espoused theory refers what physical therapists say they believe. Theory-in-use is what they actually do in their day-to-day practice when observed (Bierema, 2003). That is, physical therapists say they value evidence over experience, but they help each other learn examination and treatment interventions without regard to the lack of research evidence supporting the tests, measures, and treatment interventions. For example, a professor of physical therapy, who teaches courses in the management of people with musculosleletal disorders at a program of physical therapy offers a continuing education course on special tests for orthopedic examination of the knee. By his position on faculty he is perceived as an "expert." The text from which the professor draws his examination techniques states in the preface that for many of the tests, no peer-reviewed studies have been conducted to assess reliability, validity, sensitivity, or specificity. The professor instructs the physical therapists attending the course in the examination tests because they are "commonly used." Physical therapists attend the course and leave pleased with their skills in performing specialized tests for examination of the knee. The next week many of the therapists present in-services to acquaint the staff in their department/clinic with special

examination tests of the knee. Everyone in the department/clinic is excited about the level of mastery they are developing in special examination tests of the knee. They will use these tests to make unreliable assessments of knee problems. If asked many of the same physical therapists would tell you they believe “scientific evidence is the best source of information about what constitutes good practice, as opposed to clinical experience and authority” (Green et al., 2002, p. 5). This “scenario” is all too common and is anecdotally known to be repeated in departments/clinics throughout the state of Georgia. Thus, physical therapists report “they help each other learn,” but there is no relationship between helping each other learn and the *propensity to adopt EBP.*

It is interesting to compare the predictor variables of the short form of the DLOQ (Watkins & Marsick, 1998; Yang et al., 2002) used in this study with previous studies of using the DLOQ (Watkins & Marsick, 1998). Sta. Maria (1999; 2003) tested the effect of dimensions of the learning organization on the mandatory adoption of an innovation, an international certification system, by 11 government organizations in Malaysia. Her respondents were higher-level staff. She found that the dimensions, embedded systems, provide leadership, continuous learning, and team learning, explained the use of innovation more than the other three dimensions. McHargue (2003) surveyed directors of nonprofit organizations using the DLOQ (Watkins & Marsick, 1998). She found that embedded systems, provide leadership, debt ratio, and number of volunteers explained a proportion of the variance in financial performance; embedded systems along with volunteers, continuous learning, net assets, and number of volunteers explained a proportion of the variance in financial performance, and team learning along with number of volunteers, continuous learning along with net assets, and continuous learning with savings ratio explained a proportion of the variance in mission performance.

Selden (1998) surveyed CEOs or their designee of small family run businesses using the DLOQ (Watkins & Marsick, 1998). Embedded systems, system connection, and empowerment accounted for the most variance in knowledge performance. Empowerment, continuous learning, embedded systems, and providing leadership accounted for most of the variance in financial performance.

The studies carried out by Sta. Maria (2000; 2003) and McHargue (1999; 2003) in large organizations found embedded systems, provide leadership, continuous learning, and team learning accounted for the largest proportion of the variance. Forty one percent of the workplace settings in the present study were outpatient clinics. Outpatient clinics typically employ one to three physical therapists. It was possible that the small size of the clinics in this study did not lend themselves to *embedded systems, team learning,* or *provide leadership*. Selden (1998) also found that continuous learning, embedded systems, and provide leadership accounted for a proportion of the observed variance. Perhaps the clinics in the present study had a management structure that was so flat that there was no need for *embedded systems, team learning,* or *provide leadership*. It was interesting that *empowerment* was a predictor in small businesses (Selden, 1998) and this study in which 41% of the physical therapists worked in outpatient clinics. Both of which I speculate place emphasis on productivity.

Although it is impossible to say why there was no substantial predictive power demonstrated by the seven dimensions of the learning organization in this study, I speculate there are several reasons, which will be discussed in the sections that follow.

Exploring the literature on the learning organization and connecting the learning organization to the *propensity to adopt EBP* was a key component of this study. Review of the literature in support of the learning organization as a necessary force for adopting EBP primarily

came from the work of British physical therapists and occupational therapists. The National Health Services in Great Britain, Department of Health set as its objective in 1991 to see that research became a part of the day-to-day practice of physical therapists (Bury, 1998). As leaders in the movement toward EBP in physical therapy for over a decade, British authors and clinicians have recognized the need to change the organization at all levels (Eldridge & South, 1998: Humphris et al., 2000; Squire & Cullen, 2001). One method suggested was to change the characteristics of the social system by creating a "learning organization" (Squire & Cullen, 2000, p. 1014).

The concept of EBP in physical therapy in the United States has lagged behind the adoption of EBP in Great Britain. This paradigm shift from practice based on opinion to practice based on research evidence was formally introduced in the United States in 1992 when the *Journal of the American Medical Association* began to promote EBP through a series of articles on EBP (Evidence-Based Working Group, 1992; Guyatt et al., 2000; Guyatt, Sackett, & Cook, 1994; Oxman et al.,1993). It was not until 1996 that articles and editorials began to be published on EBP in *PT Magazine* and *Physical Therapy* (Duncan, 1996; Rothstein, 1997). Only recently has the American Physical Therapy Association formally recognized the importance of EBP. In *Vision 2020* the organization envisioned physical therapists as providers of evidence-based service through out the continuum of care (American Physical Therapy Association, 2003).

Furthermore, the concept of the "learning organization" is not widely known or practiced as a method of organizational learning among physical therapy departments in the state of Georgia. No articles have been published in *Physical Therapy* or *PT magazine* on the learning organization. No courses or workshops have been advertised promoting the learning organization. Without diffusion of information about the learning organization through journal

articles, workshops, or continuing education, there has been no systematic effort to implement the dimensions of the learning organization into healthcare systems and/or physical therapy departments in the state of Georgia.

Findings Related to Research Question # 3

The forward selection method of stepwise multiple regression was used to address the research question "To what extent do a combination of personal characteristics and the characteristics of the social system in the workplace predict the propensity to adopt?" The second phase of the analysis attempted to combine the effects of the predictor variables on the *propensity to adopt EBP*. The three variable model was the best model for predicting the *propensity to adopt EBP*. *Desire for learning* explained 14% of the observed variance in the *propensity to adopt EBP*. When *highest degree held* was added the observed variance in the *propensity to adopt EBP* improved to 19%. Adding *practicality* increased the observed variance to 23%. The combined effects suggest that *propensity to adopt EBP* is best predicted by *highest degree held, desire for learning,* and *practicality*. The variables *desire for learning, practicality,* and *highest degree held* account for a moderate proportion of the observed variance (23%) in the *propensity to adopt EBP*. The factors that produced this good predictive power should be considered by department managers, adult educators, and the national organization as key elements to include in facilitating the adoption of EBP. Models designed to facilitate adoption of EBP by physical therapists should incorporate these variables identified empirically as predicting the *propensity to adopt EBP*.

Furthermore, these personal characteristics should be acknowledged when considering the implications for practice. This study suggested multiple factors should be used to facilitate the implementation of the EBP process. There was not one magic bullet, but several factors that

significantly predicted the *propensity to adopt EBP*. Considering multiple factors will facilitate successful adoption of EBP.

It is interesting to consider why the three predictors, *desire to learn*, *highest degree held*, and *practicality* emerged as the strongest predictors of the *propensity to adopt EBP*. *Desire to learn* and *highest degree held* represent the use of knowledge and skills needed to carry out the time consuming, heavy workload of searching the literature and critically appraising the literature. At the present time, using the PICO process is the only method physical therapists have to incorporate EBP into their day-to-day practice. I speculate those who have a *desire to learn* and knowledge and skills (learned in an advanced degree, *highest degree held*) to carry out the PICO process would find the PICO process less formidable than those who do not have a *desire to learn* and/or the necessary skills to carry out the PICO process. *Practicality* emerged as a predictor because those who are not overwhelmed by the PICO process believe that EBP could fit practically in their day-to-day practice world. This study points out the need to find mechanisms to make EBP fit into the day-to-day practice of most physical therapists without interfering with productivity and the smooth and orderly flow of patients.

Conclusions

Personal factors account for the major conclusions drawn from this study. A discussion of the statistical, practical, and educational significance of each of the conclusions listed below follows.

(1) Physical therapists who had a *desire to learn* demonstrated the *propensity to adopt EBP*.

(2) Physical therapists who had obtained a higher degree (*highest degree held*) demonstrated a *propensity to adopt EBP*.

(3) Physical therapists who perceived that EBP could be used in day-to-day practice without impacting productivity or the smooth and orderly flow of patients (*practicality*) (Green et al., 2002) demonstrated the *propensity to adopt EBP*.

(4) Physical therapists who were comfortable engaging in clinical practices that were out of step with how others in the local community provide care or with what opinion leaders recommend (*nonconformity*) (Green et al., 2002) demonstrated a *propensity to adopt EBP*.

(5) The *propensity to adopt* EBP was negatively correlated with *age, years licensed as a physical therapist,* and *time spent in direct patient*. This suggested that there may be potential resistance to the *propensity to adopt EBP*.

(6) Multiple factors affected the *propensity to adopt EBP*.

(7) Significant empirical evidence was established to build a model that would predict the adoption of EBP.

Influence of Desire for Learning on the Propensity to Adopt EBP

From this study we know that *desire for learning*, a component of self-directed learning, predicts the propensity to adopt EBP. Grow (1991), Marsick (1987), and Marsick and Watkins (1999) have suggested that self-directed learning can be facilitated. Based on these findings a proposed model for adoption of EBP should include a self-directed learning module. The model would introduce self-directed learning as a means of maximizing the potential of physical therapists as self-directed learners. Some physical therapists have become accustomed to following traditional protocols that were accepted without question (Connolly et al. 2001; Rothstein, 2000). In adopting EBP, they will be asked to critically reflect on established practices in physical therapy. To maximize the benefit of self-directed learning physical therapists will need to reflect on practice and develop a process of questioning and reflecting on practice.

Reflecting on practice illustrates to physical therapists how the ordinary challenges of work can be converted into opportunities for learning (Watkins & Marsick, 1993). It is this critical reflection on practice that forms the basis for questions that lead to locating the best current research evidence on physical therapy interventions (Ebell, 1999).

Adults learn from experience and from problems in their everyday life (Knowles, 1975). Department managers, adult educators, and the profession of physical therapy need to take advantage of this theory and develop self-directed learning in physical therapists. Each day questions arise in the practice of physical therapy that go unanswered. It is in the day-to-day practice that continuing education should be taking place. Cervero (2003), a renowned expert in continuing education of medical professionals, has proposed that if "physicians are going to make good clinical judgments they need to learn from their experience in the swamp of practice" (p. S12). The same is true for physical therapists. To improve physical therapists' clinical decision making, educational interventions need to be integrated into the individual physical therapist's point of care where the individual physical therapist reflects on a particular patient about whom a question has arisen. This harkens back to the definition of self-directed learning as described by Knowles (1975):

> "Self-directed learning" describes a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies and evaluating learning outcomes. (p. 18)

At the point of care the physical therapist begins problem solving with the questions that arise in the ill-defined swamp of practice. It is in this context of patient care where the physical therapist

finds meaning and relevance. In the words of Osler (1906) the physical therapist's education begins with the patient, continues with the patient and ends with the patient as the physical therapist locates and applies information to the patient being seen. The best understanding of the problem can be achieved by answering the question in real time interaction with the patient if the best research evidence is made available at the point of care (Cervero, 2003).

If physical therapists are going to be successful lifelong learners they need to develop the skills of critical reflection at the point of care. The clinical questions they generate must be answered using the most valid and relevant information available. By answering the questions as they encounter them at the point of caring for a particular patient, physical therapists will better understand the questions generated about the particular patient and develop treatment interventions for answering the questions using the best available current research evidence. When physical therapists better understand and answer the questions as they arise at the point of care, they will provide the right treatment for the right patient and thereby improve the care of patients (Ebell & Shaughnessy, 2003). The threshold requirement to implementing EBP is developing the *desire to learn* in individual physical therapists so they are constantly questioning "Is this the best treatment based on the current research for the problem this patient is presenting?" and then seeking the best treatment intervention based on the best current research available.

In order to answer the clinical questions at the point of care, research evidence needs to be easily retrievable. The next section will discuss advances made in the practice of medicine that have made information available in a time efficient and easily retrievable manner.

Influence of Practicality on the Propensity to Adopt EBP

The study empirically demonstrates that physical therapists that hold the belief that EBP can be incorporated into their day-to-day practice without interfering with productivity or the smooth and orderly flow of patients accounts for 7 % of the proportion of the variance in the *propensity to adopt EBP*. Therefore, it is imperative that the profession of physical therapy, adult educators, and department managers investigate innovations that will make EBP user friendly, time efficient, and relevant to physical therapy practice so that productivity and the smooth orderly flow of patients will not be adversely affected.

Some advocates of EBP have encouraged the propagation of the idea that the practice of EBP requires the acquisition and development of skills in literature searching and critically appraising the literature. Specifically, they suggest using the time consuming PICO process (Bennett & Bennett, 2001; Bury, 1998; Forrest, 2001; Grandage, Slawson, Barnett, & Shaughnessy, 2002; Sackett et al.2000; Vanderkooy et al., 1999). This time consuming technique adds a heavy workload to an already busy clinician's schedule. As a result questions go unanswered and practice is not based on the best available research evidence (Slawson, et.al, 1994; Turner & Whitfield, 1997).

Slawson et al. (1994) have developed a user-friendly method of managing new information in a practical and time-efficient manner for physicians called "information mastery." The goal of this method is to have the busy clinician spend the least amount of time and energy to find the best available current research evidence. The most useful information has three key elements. First, it is relevant to everyday practice of the clinician who provides direct patient care rather as a means communication to other researchers. The information is about patient oriented outcomes that matter (POEMs) in the practice of the clinician and the information is

about the patients typically seen by the clinician or one of the other clinicians in the practice. Furthermore, the information will change the clinician's practice rather than confirming the clinician's current treatment interventions (Ebell & Shaughnessy, 2003; personal communication, M. Ebell, November 5, 2003). Second, the information is valid. Third, the information requires a minimal amount of work to locate and apply (Curley et al.1990; Ebell & Shaughnessy, 2003; Slawson et al.,1994).

Two tools have been developed for physicians to help them quickly identify information that is relevant and valid. Review services survey the original articles, summarize the articles and disseminate them to physicians by the World Wide Web, e-mail, cassette, CD-ROM, or in print form. The second tool is a hand held computer that provides information to the physician at the point of care (Ebell & Shaughnessy, 2003). The goal of the hand held computer is to provide information to physicians that they can retrieve while providing care to a particular patient rather than putting their information search off to a later time (Grandage et al., 2002).

The hand held computer has been demonstrated to be an effective method of teaching medical students how to use EBP. One hundred and sixty nine fourth year medical students at the University of Hong Kong were randomly assigned to either a control group, EBP on pocket cards, or the use of a hand held computer that contained access to the best current research evidence. The use of the hand held computer was demonstrated to improve use of evidence by the students while providing care and demonstrated positive changes in the student's confidence in clinical decision making (Leung, Johnston, Keith, Ho, & Lam, 2003).

Providing some physical therapists with a bottom line approach to the evidence they need will facilitate the adoption of EBP. First, all physical therapists are not self-directed learners. Second, some physical therapists will not sacrifice an orderly flow of patients in order to locate

and critically appraise the best current research evidence available. The proposed model takes into consideration these two ideas by developing a cadre of physical therapists within the department who will critically appraise the literature on the most frequently seen diagnoses and provide a summary at the point of care by a website, e-mail, hand held computer, or pocket guide. Currently 80.2% of the physical therapists, who are members of the American Physical Therapy Association, have an e-mail address (personal communication K. Phillips, November 7, 2003). As new information about the current best research evidence becomes available the information could be disseminated by e-mail to physical therapists. The model including suggestions for dissemination of information to facilitate the adoption of EBP will be discussed under the section implications for practice.

Influence of Highest Degree Held on the Propensity to Adopt EBP

This study demonstrated that higher degree attainment accounted for 8 % of the observed variance in the propensity to adopt EBP. To meet the accreditation requirements, master's level programs prepare physical therapists to be consumers of research (Commission on the Accreditation of Physical Therapy Education, 1996). I speculate that the research courses that are in the curricula influence physical therapists to value scientific studies over clinical experience and authority. Based on the findings of the present study the proposed model should afford opportunities to develop literature searching skills, critical appraisal skills, and skills in applying statistical findings.

The Influence of Nonconformity on the Propensity to Adopt EBP

Finally, the bivarate analysis demonstrated that *nonconformity* was related to the propensity to adopt EBP among physical therapists. Physical therapists that were comfortable engaging in clinical practices that were out of step with how others in the local community

provide care or what opinion leaders recommend (Green et al., 2002) were shown to have a *propensity to adopt EBP*. The proposed model needs to provide a forum where nonconformists can question traditional protocols and provide research evidence to support the best available care. Weekly journal clubs provide a forum for reflecting on practice.

Influence of Age, Years Licensed as a Physical Therapist, and Time Spent in Direct Patient Care

Age, years licensed as a physical therapists, and *time spent in direct patient care* were negatively correlated with the propensity to adopt EBP. Knowing that there is a lack of *propensity to adopt EBP* that increases in relation to *age*, the *years licensed as a physical therapist*, and *time spent in direct patient care* suggests there is a need to identify the source of resistance to EBP among the individual physical therapists. To facilitate a shift in the paradigm from practice based on tradition, clinical experience, unsystematic observations, intuition, and the opinions of experts (Duncan, 1997; Evidence based Medicine Working Group, 1992; Kessenich et al., 1997) to practice based on "the integration of best research evidence with clinical experience and patient values"(Sackett et al., 2000, p.1) the individual physical therapist involved in the change and their concerns about the adoption of EBP need to be considered first (Research and Development Center for Teacher Education, 1981).

Influence of Multiple Factors on the Propensity to Adopt EBP

This study identified four factors that significantly affect the propensity to adopt EBP. These factors warrant consideration when designing a model to facilitate the adoption of EBP. Support for considering multiple factors when planning strategies to facilitate the adoption of EBP comes from the medical literature. Based on a review of 102 trials, Oxman, Thompson, Davis, and Haynes (1995), found that, in general, combinations of methods have been found to be effective in implementing changes in practices of physicians. Green et al. (2002) concluded

from a study of 1,287 primary physicians, “One size does not fit all when bringing new information that might change the practice to physicians” (p. 9). This study provided managers of physical therapy departments and adult educators empirical support that multiple factors affect the *propensity to adopt EBP*. When managers plan strategies to facilitate the adoption of EBP in their departments, a model should be proposed that incorporates multiple factors that have been demonstrated to be empirically related to the *propensity to adopt EBP*.

This study provides empirical evidence of factors (*desire to learn, highest degree held, practicality*, and *nonconformity*) to consider when designing a model to adopt EBP into the day-to-day practice of physical therapists. Previous literature on adopting EBP for physical therapists has focused on encouraging physical therapists to incorporate research evidence into practice (Duncan, 1996; Rothstein 2000) or suggesting steps to follow to carry out the EBP process (Forrest, 2001; Foster et al., 2001; Vanderkooy, Bach, & Gross, 1999). No studies were located on personal characteristics of physical therapists that predict the *propensity to adopt EBP*. The processes suggested by Forrest, (2001), Foster et al. (2001), and Vanderkooy et al. (1999) for carrying out the EBP process in physical therapy have not considered the impact of personal characteristics on the *propensity to adopt EBP*. Rather, the assumption was made by the authors that introducing a particular process, the PICO process, which involves developing a clinical question, critically appraising the literature, comparing the interventions, and integrating the best research evidence with the patient’s values (Bennett & Bennett, 2001; Bury, 1998; Forrest, 2001; Foster et al., 2001; Vanderkooy et al., 1999) would lead to adoption of EBP. Unfortunately, empirical evidence has demonstrated that physical therapists are not using EBP in their day-to-day clinical decisions (Closs & Lewin 1998; Turner & Whitfield, 1997). This study did not ask clinicians whether or not they were familiar with the PICO process. Therefore, it cannot be

determined how much this passive form of dissemination affected the propensity to adopt EBP in this study.

In summary, the study identified four factors that significantly affect the propensity to adopt EBP. This section has suggested practical ways of operationalizing these factors into a model that could be implemented by a department of physical therapy. To facilitate the adoption of EBP adult educators and department mangers need to encourage the *desire for learning* and build opportunities for fostering this behavior through tutorials, small group activities, online courses and other educational interventions. Physical therapists that are comfortable engaging in practices that are out of step with others in the practice of physical therapy or opinion leaders (*nonconformity*) (Green et al., 2002) have a *propensity to adopt EBP*. Activities that foster and support *nonconformity*, such as journal clubs, need to be considered in a model for implementing EBP. Physical therapists who have earned a higher degree have a *propensity to adopt EBP*. The knowledge gained from course work for a higher degree needs to be examined, identified, and made available to physical therapists to encourage adoption of EBP. Finally, EBP needs to fit into the day-to-day practice of physical therapists without decreasing productivity or interfering with the smooth and orderly flow of patients. Innovations such as a hand held computer or a website at the point of care need to be considered to make EBP practical, user friendly, and time efficient. None of these factors individually are a magic bullet to facilitate the adoption of EBP. Therefore, multiple factors need to be included in a model that is developed to implement EBP into a department of physical therapy.

The negative correlation of *age, years licensed as a physical therapist,* and *time spent in direct patient* suggests there may potentially be resistance to the *propensity to adopt EBP*. It is imperative that the potential model to implement EBP includes a module that addresses the

concerns and problems that the individual physical therapist may have regarding the adoption of EBP. Such a model is described under implications for practice.

Implications for Practice

The findings of this study have implications for educators of physical therapy students, adult educators, and managers of physical therapy departments. The implications for physical therapy education programs and the implications of clinical practice are based on the empirical findings from this study.

Implications for Physical Therapy Educators

In the academic setting, curricula should foster the skills of lifelong self-directed learning. Lectures and tests do not instill the skills to update and replace information (Shaughnessy & Slawson, 1999). Academic institutions have an important part to play in training physical therapy students in lifelong self-directed learning and providing students with opportunities to exercise the skills in self-directed learning they have acquired (Knapper & Cropley, 2000). The shift to EBP opens the door to an opportunity to foster self-directed learning and critical reflection on practice.

First, students should be taught to hold faculty accountable for the research evidence for tests, measures, and treatment interventions they teach. Research evidence should be integrated into all courses in the curriculum. Critical appraisal should be built into the teaching of all clinical procedures rather than “Do it because (I the authority) tell you” (Stocking, 1993).

Second, rather than having the lecturer deliver the tests, measures, and treatment interventions by didactic lecture, guided design could be used. Students would work in teams of five or six. A case study would be assigned to the team. The team would be required to generate possible solutions based on research evidence, choose the most likely solution based on the level

of evidence and the patient values, analyze and evaluate the solution, and report their assignment (Knapper & Cropley, 2000). Presently, some physical therapy schools in Georgia such as the Division of Physical Therapy, Emory University foster this approach to learning through the problem solving approach to teaching and learning. Other schools such as the Physical Therapy Department, North Georgia College and State University have moved toward this design by adopting a problem based learning curriculum.

In addition, the findings suggest that the higher level of education physical therapists obtain the more likely they are to demonstrate the *propensity to adopt EBP*. Master's level and doctorate level programs of physical therapy education seem to be placing a emphasis on the belief that "scientific evidence is … the best source of knowledge about what constitutes good practice as opposed to clinical experience and authority" (Green et al., 2002, p. 5). Physical therapy education programs need to continue to emphasize the importance of practice based on the best current available research evidence integrated with clinical experience and patient values (Sackett et al., 2000).

Implications for Continuing Educators and Managers of Physical Therapy Departments

Because the study demonstrated that there is a negative correlation between *age, years licensed as a physical therapist* and *time spent in direct patient care*, managers and adult educators need to understand the concerns that the individual physical therapist in a department has regarding a shift in practice from practice based on tradition, expert opinion, unsystematic clinical experience, and intuition to practice that is based on the best research evidence (Duncan, 1997; Evidence Based Medicine Working Group, 1992; Kessenich et. al., 1997) . The *Concerns Based Adoption Model* (Hall & Hord, 1985) would be a useful model to address the concerns of the individual therapists as they adopt EBP. The *Concerns Based Adoption Model* (Hall & Hord,

1985) provides mangers and adult educators information about the common elements of the change process when dealing with key individuals. It is important that the department manager and adult educator understand how physical therapists perceive change and their concerns about change. According to Hall and Hord (1985) one of the key strengths of the *Concerns Based Adoption Model* (Hall & Hord, 1985) is that it emphasizes understanding physical therapists' attitudes and skill about EBP so that educational interventions can be directly related to what physical therapists perceive they need.

Furthermore, continuing educators and managers of physical therapy departments need to understand the impact of *desire for learning*, a measure of self directed learning on the *propensity to adopt EBP*, so they can design programs and interventions that complement self-directed learning (Fox & Bennett, 1998). Fourteen percent of the variance of the *propensity to adopt EBP* was predicted by the measures included in the *desire for learning* scale from the SDLRSNE (Fisher et al., 2001). Grow (1991), Marsick (1987), and Marsick and Watkins (1999) have suggested that self-directed learning can be facilitated. If physical therapy is going to shift from a practice based on tradition, expert opinion, unsystematic clinical observation, and intuition to practice that is based on research evidence, physical therapy educators, adult educators, and managers of physical therapy departments should design opportunities to develop self-directed learning (Duncan, 1997; Evidence Based Working Group, 1992; Kessenich et. al., 1997).

Fox and Bennett (1998) have suggested a self-directed learning curriculum. Self-directed learning is directed toward three stages: understanding personal levels of need in order to change practice, applying learning to the new competencies needed to practice differently, and

organizing learning around problems associated with using the new skill (EBP) (Fox & Bennett, 1998).

The level of need physical therapists have regarding self-directed learning and the knowledge, skill, and education necessary to practice EBP need to be given consideration. Opportunities to foster self-directed learning must be made available. One such way might consist of managers gathering information on the most frequently seen diagnosis by their department. Small groups then locate and critically appraise the relevant research evidence on a particular diagnostic category. Next, the small group discusses the evidence in relation to evidence that matters to the patients that the physical therapists see in their practice. If the group determines the evidence is valid, the small group discusses how they will change their practice to implement the best current research evidence (Slawson et al., 1994). This type of activity acknowledges the theory of the adult learner, who according to Knowles (1975) is increasingly a self-directed organism. Furthermore, in keeping with adult learning theory this type of activity allows the physical therapists to learn from their own life experience and practice of physical therapy using problem centered learning (Knowles, 1975). Based on his assumptions Knowles, like Grow (1991), Marsick (1987), and Marsick and Watkins (1999), posits that self-directed learning can be facilitated. Continuing education should be designed to facilitate self-directed learning, to encourage active inquiry among the physical therapy staff, and concomitantly foster the adoption of EBP.

Since the *highest degree held* was demonstrated to influence the *propensity to adopt EBP*, the evaluation of the course work now required for accreditation should be compared to undergraduate curricula prior to the requirement that all entry-level programs move to the Master's level. The purpose of assessing the difference in the curricula would be to determine the

knowledge and skills taught in the master's level curricula that encourage the *propensity to adopt EBP*. Once identified, physical therapists with knowledge and skill deficits could be given access to self-directed learning activities, tutorials, and seminars to foster competency in those areas.

Practicality was shown to account for 7% of the separate effects of the observed variance in the *propensity to adopt EBP* when bivarate analyses were run and 4% of the observed variance in the best three-model predictor of the *propensity to adopt EBP*. Where there is research evidence available, there needs to be some mechanism of information available so that all physical therapists can base their interventions on the best available research evidence (Ward, 2000). Lack of time has been identified as a major barrier to implementing EBP (Bury, 1998; Closs & Lewin, 1998; Jette, 2003).

Busy physical therapists need an efficient, easily understood summary of the best current research that is relevant to their practice. Unlike physicians, they do not have a resource to summarize the best current research available such as POEMs (Shaughnessy & Slawson, 1999). The American Physical Therapy Association has developed, *Hooked on Evidence* (http://apta.org/hookedonevidence) that provides summaries of single journal articles. Similarly, the University of Sydney has created a website that summarizes single articles (ptwww.cchsusyd.edu.au/pedro/). Neither of these websites provides a comprehensive review of research evidence on a clinical problem. Foster et al. (2001) have suggested physical therapists develop and use critically appraised topics, which summarize the best available evidence on a clinical question and include a bottom line. While this method has the potential to facilitate understanding of research evidence and disseminate research evidence among physical therapists at the local level, comprehensive exploration of all relevant published and unpublished articles may not occur (Foster et al., 2001; Slawson et al., 1994). Furthermore, attaining the skills for

producing critical appraisal of the literature requires intensive study and is time consuming (Guyatt et al., 2000; Shaughnessy & Slawson, 1999). What is needed is a cadre of physical therapists who have the knowledge and skills to produce bottom line summaries of the best current available research evidence for each patient diagnostic classification and make this available world wide by the internet or at the point of care by a hand held computer or website (Shaughnessy & Slawson, 1999).

A proposed model for implementing the adoption of EBP follows. The model is based on the findings from this study and concepts presented by Bennett and Bennett (2001), Fox and Bennett (1998), Vanderkooy et al. (1999), and Watkins and Marsick (1993).

Stage one: Assess the concerns of the individual physical therapist regarding the shift to EBP using the *Concerns Based Adoption Model* (Hall & Hord, 1985). (Addresses empirical evidence that *age, years licensed as a physical therapist*, and *time spent in direct patient care* were negatively correlated with the *propensity to adopt EBP*).

Stage two: Assessment and implementation of self-directed learning. (Takes advantage of empirical evidence for *desire to learn*).

The individuals in the physical therapy department are assessed on their readiness for self-directed learning and capacity to critically reflect on one's action using the *desire for learning* scale (Fisher et al., 2001). The assessment is followed by a general discussion of the usefulness of self-directed learning in the therapists' daily lives and day-to-day practice. The principles of refection in and on action are discussed (Schön, 1983). Case studies on reflection in and on action are presented.

Stage three: Learning is directed toward personal levels of need. (Takes advantage of empirical evidence for *desire to learn*).

1. If individuals score low on the assessment, they would be provided with one or more of the following experiences in self-directed learning and critical reflection: organized experiences with structured opportunities to practice self-directed learning, mentoring or coaching in self-directed learning, instruction in adult learning principles, and didactic instruction in self-directed learning or self-learning packages with or without the assistance of technology (Watkins & Marsick, 1993).

2. Opportunities are created to assist physical therapists in identifying gaps between what the physical therapists ought to know or do and what they currently know and do (Fox and Bennett, 1998). Drawing on the work of Osler (1906), the patient will be the primary tool of learning. The physical therapists' learning begins with the patient, continues with the patient and ends with the patient. The staff is asked to identify the top twenty diagnostic categories of patients they saw the last year. The staff reflects on the best current research evidence available for tests, measures, and treatment interventions of the most frequently seen diagnostic categories.

3. A forum is planned for presenting the best current available research on tests, measures, and treatment interventions used by individual physical therapists. Those who present research evidence are invited to share with the department strategies for locating research evidence to support examinations and treatment interventions.

4. Next, each physical therapist assesses their needs in the principles of EBP, literature search strategies, research design, statistics, and/or critical appraisal of the literature.

Stage four: Principles of EBP. (Takes advantage of empirical evidence for *highest degree held*).

Teach the entire staff to assemble and evaluate information to provide answers to the clinical problems using “Information Mastery” (Shaughnessy, Slawson & Bennett, 1994; Slawson et al., 1994).

- Discuss physical therapists’ learning needs to keep up to date on the best research evidence.
- Discuss accepting personal responsibility for providing the right treatment intervention for the right patient at the right time.
- Discuss the reasons for developing “information mastery.” Describe the usefulness equation and define work, relevance, and validity.
- Describe POEMs (Patient Oriented Evidence that Matters) versus DOEs (Disease Oriented Evidence).
- Case study: Putting the relevance equation into practice (Slawson, Shaughnessy, Newton, Douglas, 1995).

Stage five: Literature search strategies. (Takes advantage of empirical evidence for *highest degree held*).

This module is optional. Those who have an interest in learning how to search the literature and those who desire to develop the skills necessary to critically appraise and summarize the research evidence are invited to attend these sessions.

1. A librarian provides workshops on search methods and explains his or her role in assisting the physical therapy department in locating research evidence.

2. Tutorials are made available on “Hooked on Evidence” (http://apta.org/hookedonevidence), Pedro (http://pedro.fhs.usyd.edu.au/), and/or PubMed (www.ncbi.nlm.nih.gov/PubMed).

3. Opportunities are made available for technical practice with case scenarios to be compared along with an expert in the department or a peer.

4. Physical therapists learn to maximize search strategies.

- Articles are made available on maximizing search strategies.
- Small group sessions on case scenarios are made available.
- Seminars/tutorials with the librarian are made available (Vanderkooy et al., 1999).

Stage six: Supplemental training in statistics and research methods. (Takes advantage of empirical evidence for *highest degree held*).

This module is optional. Those who have an interest in developing knowledge and skills in statistical and research methods and those who desire to develop the skills necessary to critically appraise and summarize the research evidence are invited to attend these sessions. Seminars, on line tutorials, tutorials by experts, and workshops are made available as needed.

Stage seven: A cadre of physical therapists is selected to develop expertise in critical appraisal of the research evidence. (Takes advantage of empirical evidence for *practicality*).

1. The cadre of physical therapists attends advanced seminars, tutorials, and workshops on critical appraisal of the literature.

2. The cadre of physical therapists discusses case examples with the small group.

3. The cadre of physical therapists utilizes a checklist for critically appraising the literature.

4. The cadre of physical therapists participates in an Internet list serve for critical appraisers of the literature (Vanderkooy et al.).

Stage eight: Implementing EBP. (Takes advantage of empirical evidence for *practicality*).

1. The cadre of physical therapists within the department summarizes the best available evidence on the most frequently seen physical therapy diagnostic categories and presents a bottom line summary on the research evidence available for each diagnostic category (Foster, et al. 2001).

2. Bottom line summaries are made available to all staff physical therapists. Summaries are collected and posted on a department website. Hard copies are placed in a loose-leaf notebook that can be updated as the most current research evidence becomes available. Each physical therapist is provided with a loose-leaf pocket guide of summaries of the best current research evidence available on the most frequently seen physical therapy diagnostic categories in the department. E-mails are sent to each physical therapist to inform them of new research evidence as it becomes available.

Stage nine: Maintaining EBP.

1. The cadre of physical therapists regularly reviews the literature to keep up to date with new information on patient oriented evidence that matters to the particular patient population seen by the department (Slawson et al., 1994). The cadre critically appraises the research evidence and produces a bottom line summary. The bottom line summaries are distributed by the website and e-mail. Hard copies are made for the department notebook and pocket guides.

2. Weekly sessions are held department wide to discuss successes, problems and concerns with implementing EBP in day-to-day practice.

3. Evidence-based journal clubs within the physical therapy department are held weekly (Turner, 2001). (Takes advantage of empirical evidence for *desire for learning* and *nonconformity*).

The topics for the journal club are triggered by problems and questions that arise in the day-to-day practice of the physical therapists during the week. The journal club facilitates active inquiry by presenting patient problems as they arise from patient care. The patient problems serve as a resource to reflect on current treatment interventions, to direct literature searches, and to guide critical appraisal of relevant research evidence. (Rosenberg & Donald 1995; Watkins & Marsick, 1993). The presentation of a problem from practice allows the physical therapists "to say what is wrong and in what directions" (Schön, 1983, p. 40) the clinical decision needs to be changed to ameliorate the problem. Topics, bottom line summaries, and supporting journal articles are made available to each physical therapist in a timely manner prior to the journal club meeting.

4. Journal club meetings are designed to meet the requirements for continuing education units.

5. Release time is made available for attendance at seminars, tutorials, workshops on statistics, research design, literature searches, and critical appraisal skills as deemed necessary by the individual.

6. New employees are assessed on concerns regarding EBP, self-directed learning, oriented to EBP, and provided with training opportunities.

Stage ten: Reflection on action.

Information learned about the best current research evidence available is implemented into the day-to-day practice of the physical therapists in the department (Watkins & Marsick, 1993).

Stage eleven: Document.

Plans of care and critical pathways are updated to reflect the best available research. The website, master copy of best available research evidence notebook, and pocket guides to the best research evidence are updated as new information is identified and summarized (Watkins & Marsick, 1993).

Stage twelve: Evaluation.

Peer reviewers audit charts for use of research evidence in day-to-day practice.

This model was proposed to support and operationlize into practice the conclusions drawn from this study. *Desire for learning, highest degree held, practicality* and *nonconformity* predict the *propensity to adopt EBP*. Multiple factors predict the *propensity to adopt EBP*. *Age, years licensed as a physical therapist*, and *time spent in direct patient* care were negatively correlated with the *propensity to adopt EBP*. The proposed model provides a practical application of the four factors that were empirically demonstrated to predict the *propensity to adopt EBP* and considers the potential problems uncovered in the findings that *age, years licensed as a physical therapist* and *time spent in direct patient care* were negatively correlated.

Implications for Theory

This study added to the body of knowledge on adoption of innovations and provided empirical support for the influence of personal characteristics on the adoption of a particular innovation, *propensity to adopt EBP*. The study demonstrated empirically that there were four factors that significantly influenced the *propensity to adopt EBP*. Separately *desire for learning, highest degree earned, practicality*, and *nonconformity* demonstrated a significant correlation to the *propensity to adopt EBP*. The best three variable model (*desire for learning, highest degree*

earned, and practicality) accounted for 23% of the observed variance in the propensity to adopt EBP.

Much of innovation research has focused on the individual bias in implementing an innovation (Rogers, 1983). This study supports the salience of the individual in the adoption of this particular innovation, EBP. The statistically significant moderate level predictor variables were all related to the individual. This study provided empirical evidence that individual characteristics affect the *propensity to adopt EBP*.

The three variable predictor model suggests that it is at the individual level where changes will need to occur for successful implementation of EBP. The model suggests the individual will need to develop skills in *desire for learning* and learn the skills achieved by those with the *highest degree held*.

The findings from the bivarate analysis in this study that those with higher degrees are more likely to adopt EBP coupled with the negative correlation of *age*, *years licensed as a physical therapist*, and *time spent in direct patient care* suggests that there are potentially knowledge and skill deficits that affect the *propensity to adopt EBP* under the current system of diffusion. Based on this suggestion, I believe it is very important that the department manager or adult educator, who is implementing EBP be aware of the concerns, needs, and problems that individual physical therapist may face in adopting EBP. Those responsible for implementation need to take into consideration and address the potential problems that knowledge deficits such as learning literature search strategies and critical appraisal skills may present for some physical therapists in adopting EBP. Therefore, strategies to make evidence available in a user friendly, time efficient manner may need to be made available if EBP is to be successfully implemented. Providing physical therapists with bottom line summaries does the heavy lifting and decreases

the time burden. The findings in the study suggested that those who believed EBP practically fit their day-to-day practice world without adversely interfering with productivity and the smooth orderly flow of patients were likely to adopt EBP (Green et al., 2002). This lends support to the theory by Slawson et al. (1994) that all clinicians do not need to learn to carry the heavy workload of searching the literature and critically appraising the literature for its level of evidence. The most efficient manner of getting EBP into practice may be providing bottom line summaries to physical therapists.

In summary the study added to the theory of diffusion of innovations the influence of personal characteristics on the adoption of a particular innovation, the propensity to adopt EBP. The study also, lends support to the importance of meeting the personal needs of physical therapists when implementing the adoption of EBP. One personal need that was identified was that physical therapist who believe EBP can be implemented without interfering with productivity or the orderly flow of patients were likely to adopt EBP (Green et al., 2002). Department managers and adult educators who are attempting to facilitate the adoption of EBP need to identify strategies to make EBP practically fit into the day-to-day practice of physical therapy.

Future Research

Future research should focus on implementing the model described under implications for practice and examining the effectiveness of the model on behavioral change of individuals in adopting EBP. Prior to development of the model, descriptive studies of physical therapy baccalaureate level programs and master's level entry programs need to be examined for the differences in course content and teaching learning strategies to identify knowledge and skills that should be included in a model for implementing EBP.

Second, there is a need to investigate the propensity to adopt EBP through qualitative research. Through the use of interviewing and focus groups additional factors that affect the propensity to adopt EBP could be identified. Identification of additional factors would provide the researcher with the information needed to study variables that were not included in this study.

Third, identification of the salience of personal characteristics in this study suggests physical therapists may not respond to information in the same way. To facilitate the adoption of EBP in physical therapy it may be useful to classify physical therapists according to how they prefer to receive information. Wyszewianski and Green (2000) have proposed a theoretical framework that classifies physicians into four categories on the basis of how they respond to new information about the effectiveness of clinical strategies. Future research should focus on classifying physical therapists into categories according to how they respond to new information. In other words, like physicians, physical therapists may respond to information about the effectiveness of clinical strategies based on traits. If empirical evidence is established that substantiates that physical therapists can be classified into categories according to how they respond to new information, models for implementing EBP could be designed and tested based on the interventions linked to the traits that were identified in the seminal work by Wyszewianski and Green (2000).

Fourth, healthcare systems that have officially embraced the learning organization need to be identified through randomly sampling the major healthcare systems in Georgia using the DLOQ (Watkins & Marsick, 1998). Next, a cross sectional study could be performed to randomly sample and compare members of rehabilitation departments in healthcare systems that have embraced the principles and concepts of the learning organization with healthcare systems that have not embraced the principles and concepts of the learning organization using the

instrument developed for this study, *Factors Affecting the Propensity to Adopt Evidence-Based Practice* .

Fifth, size and organizational structure may play an important role in the effects of the characteristics of the social system on the *propensity to adopt EBP*. Sta. Maria (2000; 2003) tested the effect of dimensions of the learning organization on the mandatory adoption of an international certification system by 11 government organizations. She found that the dimensions of the learning organization explained a significant portion of the variance of the use of the innovation in all 11 of the organizations, however, the variables that explained the use of the innovation varied radically from organization to organization. She concluded that researchers needed to consider organizational context. This study surveyed physical therapists in a variety of settings ranging from outpatient clinics that typically employ one to three therapists to hospitals they may have 20 to 40 physical therapists on staff. Future research should focus on practices with similar organizational structures and size. Cross-site analyses that include all physical therapists in an organization would be helpful.

Finally, this study considered a limited model of prediction. It did not consider the effects of the characteristics of the innovation on the *propensity to adopt EBP*. Future studies should include an index of the characteristics of the innovation including: the relative advantage of EBP, compatibility of EBP, complexity of EBP, trialability of EBP, and observability of EBP.

Limitations

The predictor variables employed in this study were selected based on a review of the literature. However, as with any study I studied only a finite number of variables. There were many variables that could have been considered including: ability to critically appraise the literature, ability to understand statistics, skills in computer and Internet access, knowledge of

online databases, training in search strategies, amount of time available to research evidence, presence of an on site library, availability of library personnel to assist with researching evidence, presence of weekly case studies, or presence of a journal club in the facility or the community.

Another limitation was the low reliability of *practicality* and *nonconformity*. The nonconformity and practicality scales were adapted from the instrument by Green et al. (2001) developed for physicians. Although it is impossible to say why these reliability problems developed, I speculated that physical therapist's beliefs may be different from physicians because they have less access to materials such as evidence-based guidelines to inform them (Jette et al. 2003). Another possibility was that the adaptation of the instrument may have harmed the reliability as opposed to helping it.

The final limitation deals with the sample. Because the sample frame only covered physical therapists licensed by the state of Georgia, generalization to other groups must be handled by logical rather than statistical inference.

Chapter Summary

This chapter has interpreted the findings from Chapter Four by discussing the findings of each of the research questions and drawing conclusions. Personal characteristics d*esire to learn*, *highest degree held*, *practicality*, *nonconformity*, and *gender* were discussed as predictors of EBP. The impact of *age*, *years licensed as a physical therapist*, and *time spent in direct patient care* were considered regarding implementation of EBP. The characteristics of the social system that emerged as minimal predictors, *empowerment*, *continuous learning*, and *systems connection* were discussed and compared to other studies using the DLOQ (Marsick & Watkins, 1998). The implications for theory were discussed. The implications of the findings from this study were

discussed for educators of physical therapy students. A model for implementing EBP was outlined. Suggestions for future areas of research were made. Finally, the limitations of the study were discussed.

Conclusion

The profession of physical therapy has begun moving toward adopting EBP. This study considered the factors that affect the *propensity to adopt EBP*.

The study found that physical therapists who are licensed by the state of Georgia generally agree with the belief "that scientific evidence is the best source of knowledge about what constitutes good practice as opposed to clinical experience and authority" (Green et al., 2002, p. 5). However, *age*, *years licensed as a physical therapists* and *time spent in direct patient care* were negatively correlated with the belief "that scientific evidence is the best source of knowledge about what constitutes good practice as opposed to clinical experience and authority" (Green et al., 2002, p. 5). The negative correlation suggests there were concerns and needs among this cohort of physical therapists that a change agent/department manager/adult educator will need to address to successfully implement EBP. This study empirically demonstrated that *desire for learning*, *highest degree held*, *practicality*, and *nonconformity* positively influence the propensity of physical therapists to adopt EBP. These variables should be used when designing models to implement EBP in the day-to-day practice of physical therapists. Furthermore, this study demonstrated that multiple factors influence the propensity to adopt EBP. Therefore, any approach to encourage departments of physical therapy to adopt EBP should address multiple factors, because it is likely that multiple factors will be needed to successfully implement EBP. Finally, a large proportion of the propensity to adopt EBP was not accounted for in this study.

Future studies should identify the variables that account for the unexplained proportion of variance in the propensity to adopt EBP.

REFERENCES

Al-Obaidi, S., Anthony, J., Dean, E., Al-Shuwai, N. (2001). Cardiovascular response to repetitive McKenzie lumbar spine exercises. *Physical Therapy*, *81*(9), 1524-1533.

American Physical Therapy Association. (2002). *APTA* v*ision sentence for physical therapy 2020 and APTA vision statement for physical therapy HOD 06-00-24-35.* Retrieved April 7, 2003 from http://www.apta.org/governance/HOD/HODpolicies/Section_I/Goals_AND_Mission/HOD_06002435

Argyris, C. (1991). Teaching smart people how to learn. *Harvard Business Review,* May-June, 99-109.

Argyris, C., & Schön, D. A. (1978). *Organization learning a theory of action perspective.* Reading, MA: Addison-Wesley Publishing.

Argyris, C., & Schön, D. A. (1996). *Organization learning II.* Reading, MA: Addison-Wesley Publishing.

Barnard, S., & Wiles, R. (2001). Evidence-based physiotherapy. *Physiotherapy*, *83*(3), 115-124.

Barnitt, R. (1999). Reflect, research, revise. *British Journal of Occupational Therapy*, *62*(9), 405-412.

Bartlett, D. (2000). Invited commentary. *Physical Therapy*, *80*(1), 44-45.

Belenky, M. F., Clinchy, B. M., Goldberger, N. R., Tarule, J. M. (1997). *Women's ways of knowing*. New York: Basic Books.

Bennett, S., & Bennett, J. W. (2000). The process of evidence-based practice in occupational therapy: informing clinical decisions. *Australian Occupational Therapy Journal, 47,* 171-180.

Benveniste, G. (1987). *Professionalizing the organization.* San Francisco: Josey-Bass Publishers.

Bero, L. A., & Rennie, D. (1995). The Cochrane collaboration. *Journal of the American Medical Association, 274*(24), 1935-1938.

Bierema, L. L., (1999). The process of the learning organization: Making sense of change. *NASSP Bulletin*, February, 46-56.

Bierema, L. L., (2003). Systems thinking: A new lens for old problems. *The Journal of Continuing Education in the Health Professions, 23*(1), S27-S33.

Bithell, C. (2000). Evidence-based practice: Some thoughts on best evidence. *Physiotherapy, 86*(2), 58-60.

Blanton, S., & Wolf, S. L. (1999) An application of upper-extremity constraint-induced movement therapy in a patient with sub acute stroke. *Physical Therapy, 79*(9), 847-853.

Blood, H., Hislop, H., Johnson, G., Magistro, C. M., Moore, M. L., Sharmann, S., Schmoll, B. J., Wolf, S. L. (2000). Forecast 2000. *Physical Therapy Magazine, 8*(1), 38-42.

Board of Directors Minutes, American Physical Therapy Association (2001, November 11). Autonomous Physical Therapy Practice: Definition and Attributes. Retrieved October 23, 2003, from http.www.apta.org/pdfs/governance/BodMinNov01.pdf

Bonham, L. A. (1989). Self-directed orientation toward learning : A learning style. In H. B. Long (Ed.), *Self-directed learning: Emerging theory and practice* (pp. 13-42). Norman, OK: Oklahoma Research Center for Continuing Professional and Higher Education.

Bonham, L. A. (1991) Guglielmino's self-directed learning readiness scale: What does it measure? *Adult Education Quarterly, 41*(2), 92-99.

Bouchier, I. (1997). Getting research into practice. *Health Bulletin, 55*(1), 62-67.

Brockett, R. G. (2002, August, 15). Characteristics of the self-directed learner. In *Self-directed learning resources.* Retrieved April 25, 2002 from http://bus.utk.edu/dlfsdlr/default.htm

Brockett, R. G., & Hiemstra, R. (1991). *Self-direction in adult learning.* New York: Routledge.

Brookfield, S. (1984). Self-directed adult learning: A critical paradigm. *Adult Education Quarterly, 35*(2), 59-71.

Brookfield, S. (1985). Self-directed learning: A critical review of research. In S. Brookfield (Ed.), *Self-directed learning from theory to practice* (pp. 5-16). New Directions in Adult and Continuing Education, No. 25. San Francisco: Josey Bass Inc.

Brown, S. J. (1999). *Knowledge for health care practice*. Philadelphia: W.B. Saunders Company.

Bury, T. (1998). Evidence-based healthcare explained. In T. Bury & J. Mead (Eds.), *Evidence-based healthcare* (pp. 3-25). Boston: Butterworth-Heinemann.

Bury, T., & Jeorsch-Herold, C. (1998). Reading and critical appraisal of the literature. In T. Bury & J. Mead (Eds.) *Evidence-based healthcare* (pp. 136-166). Boston: Butterworth-Heinemann.

Caffarella, R. S. (1993). Self-directed Learning. In S. Merriam (Ed.), *An update on adult learning theory* (pp. 25-33). New Directions in Adult and Continuing Education, No.57. San Francisco: Jossey-Bass.

Caffarella, R. S., & O'Donnell, J. M. (1987). Self-directed adult learning: A critical paradigm revisited. *Adult Educational Quarterly, 37*(4), 199-211.

Caffarella, R. S. & Olson, S.K. (1993). Psychosocial development of women: A critical review of the literature. *Adult Educational Quarterly, 43*(*3*), 125-151.

Candy, P. (1991). *Self-direction for lifelong learning.* San Francisco: Jossey-Bass Publishers.

Cavaliere, L. A. (1992). The Wright brothers' odyssey: Their flight of learning. In L.A. Cavaliere & A. Sgroi (Eds.), *Learning for personal development* (pp. 51-59). New Directions in Adult and Continuing Education, No. 53. San Francisco: Jossey-Bass.

Cervero, R. M. (1985). Continuing professional education and behavioral change: A model for research and evaluation. *The Journal of Continuing Education in Nursing*, *16*(3), 85-88.

Cervero, R. M. (2003). Place matters in physician practice and learning. *The Journal of Continuing Education in the Health Professions, 23*(S1), S10-S18.

Charlton, B. G. (1997). Restoring the balance: Evidence-based medicine put in its place. *Journal of Evaluation of Clinical Practice, 3*(2), 87-98.

Chassan, J. B. (1979). *Research design in clinical psychology*. New York: Irvington Publishers, Inc.

Chassin, M. R. (1998) Is health care ready for six sigma quality? *The Milband Quarterly*, 76(4), 565-591.

Clinical Governance Support Team. (2002). *A vision of high quality care*. Retrieved October 24, 2000 from http://www.cgsupport.org.

Closs, S. J., & Lewin, B. J. P. (1998). Perceived barriers to research utilization: A survey of four therapies. *British Journal of Therapy, 5,* 151-155.

Cochrane, A. L. (1955). Symposium on widening the horizon of preventive medicine: The medical officer of health as an epidemiologist. *Royal Society for Promotion of Health Journal, 75,* 584-587.

Cochrane, A.L. (1972). *Effectiveness and Efficiency*. London: The Nufield Provincial Hospital Trust.

Commission on Accreditation for Physical Therapy Education. (1996). *Evaluation criteria for accreditation of education programs for the preparation of physical therapists*. Retrieved October 22, 2003 from http://www.apta.org/PDF/accreditation/AppendixB-PT-Criteria3.8.3.10PDF

Connolly, B., Lupinnaci, N. S., Bush, A. J. (2001). Changes in attitudes and perceptions about research in physical therapy among professional physical therapist students and new graduates. *Physical Therapy, 81*(5),1127-1134.

Cormack, J. C. (2002, February). What is evidence-based practice? What does it mean? In J. C. Cormack (Chair), *What is evidence-based practice (EBP)?* Preconference conducted at the meeting of the American Physical Therapy Association, Boston, MA.

Coyne, C. (2002). Getting hooked on evidence. *PT Magazine*, June, 34-39.

Cummings, T. G., & Worley, C. G., (2001). *Organizational development and change* (7th ed.). Cincinnati, OH: South-Western College Publishing.

Curley, S. P., Connelly, D. P., & Rich, E. C. (1990). *Medical Decision Making, 10,* 231-241.

Daley, B. (1999). Novice to expert: An exploration of how professionals learn. *Adult Education Quarterly, 49* (4), 133-147.

Danis, C. (1992). A unifying framework for data-based research into adult self-directed learning. In H.B. Long & Associates (Eds.), *Self-directed learning: Application and research* (pp. 47-72). Norman: Oklahoma Research Center for Continuing Professional and Higher Education, University of Oklahoma.

Delito, A. (1998). Clinicians and researches who treat and study patients with low back pain: are you listening? *Physical Therapy, 78*(7), 705-707.

Dewey, D. (2000). What evidence? *Physical Therapy, 80*(1), 113.

Dixon, N. (1994). *The organizational learning cycle.* New York: McGraw Hill.

Dromerick, A. W. , Edwards, D. F. & Hahn, M. (2000). Does the application of constraint-induced movement therapy during acute rehabilitation reduce arm impairment after ischemic stroke? *Stroke, 31*(12), 2984-2988.

Duncan, P. W. (1996). Evidence-based practice. *PT Magazine, 4*(12), 44-48.

Easterby-Smith, M. (1997) Disciplines of organizational learning: Contributions and critiques. *Human Relations, 50*(9), 1085-1113.

Ebell, M. (1999) Information at the point of care: answering clinical questions. *Journal of Family Practice, 12*(3), 225-235.

Ebell, M. H., & Shaughnessy, A. (2003). Information mastery: Integrating continuing medical education with the information needs of clinicians. *The Journal of Continuing Education in the Health Professions, 23*(S1), S53-S62.

Eldridge, K., & South, N. (1998). Slow-acting remedy. *Health Service Journal,* May, 24-25.

Ellinor, L., & Gerand, G. (1998). *Dialogue rediscovering the transforming power of conversation.* New York: John Wiley & Sons Inc.

Erwin, W. J., & Wheelright, L. A., (2002). Improving mail survey response rates through the use of a monetary incentive [Electronic version]. *Journal of Mental Health Counseling, 24* (3), 247-255.

Evidence-Based Medicine Working Group. (1992). Evidence-based medicine a new approach to teaching the practice of medicine. *Journal of the American Medical Association, 268* (17), 2420-2325.

Field, L. (1989). An investigation into the structure, validity, and reliability of Guglielmino's self-directed learning readiness scale. *Adult Education Quarterly*, *39*(3), 125-139.

Fisher, M., King, J., & Tague, G. (2001). Development of a self-directed learning readiness scale for nurse education. *Nurse Education Today*, *21*, 516-525.

Forrest, J. (2001, July). *Teaching EBDM to students*. Lecture presented at Faculty Development Institute, Los Angeles, CA.

Forrest, J. (2001, July). *EBDM concept, principles & skills*. Lecture presented at Faculty Development Institute, Los Angeles, CA.

Forrest, J. (2001). Enhancing your practice through evidence-based decision making. *Journal of Evidence Based Dental Practice, 1,* 51-57.

Foster, N. Barlas, P. Chesterton, L. & Wong, J. (2001). Critically appraised topics (CATs): one method for facilitating evidence-based practice in physical therapy. *Physiotherapy*, *87*(4), 179-191.

Fowler, F. J. (1993). *Survey research methods* (2nd ed). London: Sage Publications.

Fox, R. D., & Bennett, N. L. (1998). Learning and change: Implications for continuing medical education. *British Medical Journal, 316,* 466-468.

Fox, R. J., Crask, M. R., & Kim, J. (1988). Mail survey response rate. *Public Opinion Quarterly, 52,* 467-491.

Fraser, S. W., & Greenhalgh, T. C. (2003). Coping with complexity: Educating for capability: *British Medical Journal, 323,* 799-803. Retrieved November 20, 2003.

Freburger, J. K. (2000). An analysis of the relationship between the utilization of physical therapy services and outcomes of care for patients after total hip arthroplasty. *Physical Therapy*, *80*(5), 448-458.

Garrison, D. R. (1997). Self-directed learning: Toward a comprehensive model. *Adult Education Quarterly*, *48*(1), 18-33.

Garvin, D. A. (2000). *Learning in action.* Boston, MA: Harvard Business School Press.

Gephart, M., Marsick, M., Van Buren, M., & Spiro, M., (1996). Learning organizations come alive. *Training and Development,* December, 35-45.

Georgia Physical Therapy Workforce 2001, (2001). Retrieved October 17, 2003 from http://www.healthworkforce.mcg.edu/Physical%20Therapy/pt%20report.pdf

Gleeson, P. (2001). unpublished questionnaire. Texas Women's College, Houston, TX.

Gleeson, P. B., & Cormack, J. C. (2002, February) Implementing evidence based practice in the clinic. In J. C. Cormack (Chair), *What is evidence-based practice (EBP)?* Preconference conducted at the meeting of the American Physical Therapy Association, Boston, MA.

Graham, G. (1996). Clinically effective medicine in a rational health service. *Health Director,* June, 11-12.

Grandage, K. K., Slawson, D. C., Barnett, B. L. & Shaughnessy, A. F. (2002). When less is more: a practical approach to searching for evidence-based answers. *Journal of the Medical Library Association*, *90*(3), 298-304. Retrieved November 7, 2003 from http:?? www. Pubmedcentral.gov/articlerender.fcgi?tool=pmcentrez&artid=116402

Gray, M. J. A. (1998). Where is the chief knowledge officer? *British Medical Journal, 317*, 832.

Green, L. A., Gorenflo, D. W., & Wyszewianski, L. (2001). *Psychometric Instrument for Selecting Interventions to Change Physician Practice Pattern.*

Green, L. A., Gorenflo, D. W., & Wyszewianski, L. (2002). *Validation of an instrument for selecting interventions to change physician practice patterns.* A Michigan Consortium for Family Practice Research Study.

Greenhalgh, T. (1996). Is my practice evidence-based? *British Medical Journal, 313,* 957-958.

Greenhalgh, T., Hughes, J., Humphrey, C., Rogers, S., Swinglehurst, D., & Martin, P. (2002). A comparative case study of two models of a clinical informationist service. *British Medical Journal, 324,* 524-529.

Grow, G. O. (1991). Teaching learners to be self-directed. *Adult Education Quarterly*, *41*(3), 125-149.

Guglielmino, L. M. (1977). *Development of an instrument for self-directed learning.* Unpublished doctoral dissertation, University of Georgia, Athens.

Guyatt, G. H., Haynes, R. B., Jaeschke, R. Z., Cook, D. J., Green, L., Naylor, C. D., Wilson, M. C., & Richardson, W. S. (2000). User's guide to the medical literature XXV. Evidence-based medicine: Principles for applying the user's guides to patient care. *Journal of the American Medical Association*, *284*(10), 1290-1296.

Guyatt, G. H., Meade, M. O., Jaeschke, R. Z., Cook, D. J., & Haynes, R. B. (2000). Practitioners of evidence-based care. *British Medical Journal, 320,* 954-955.

Guyatt, G. H., Sackett, D. L., & Cook, D. J. (1994). User's guide to the medical literature. How to use an article about therapy or prevention. *Journal of the American Medical Association, 271*(1), 59-63.

Hall, G. E., Hord, S. M. (1985). *Change in schools: Facilitating the process.* Austin, TX: Reseach and Development for Teacher Education, University of Texas at Austin.

Haynes, B., & Haines, A. (1998). Getting research into practice. *British Medical Journal*, *317*, 273-276.

Hagen, C. (1999). *Rehabilitation in managed care.* Gaithersburg, MA: Aspen Publishers, Inc.

Herbert, R. D., Sherrington, C., Maher, C., & Moseley, A. M. (2001). Evidence-based practice–imperfect but necessary. *Physiotherapy Theory and Practice*, *17*, 201-211.

Higgs, J., & Titchen, A. (1995). The nature, generation and verification of knowledge. *Physiotherapy*, 81(9), 521-529.

Huber, G. P. (1991). Organizational learning: The contributing processes and the literatures. *Organization Science*, *2*(1), 88-115.

Humphris, D., Littlejohns, P., Victor, C., O'Halloran, P., & Peacock, J. (2000). Implementing evidence-based practice: Factors that influence the use of research evidence by occupational therapists. *British Journal of Occupational Therapy*, *63*(11), 516-522.

Hurley, M. (2000). Linking research with practice-the missing link. *Physiotherapy*, *86*(7), 339-341.

InfoPOEMS: the clinical awareness system. Retrieved May 27, 2002, from http://www.infopoems.com/validity.cfm.

Jensen, G. M., Gwyer, J., Shepard, K. F., & Hack, L. M. (2000). Expert practice in physical therapy. *Physical Therapy*, *80*(1), 28-43.

Jette, D. U., Bacon, K., Batty, C., Carlson, M., Ferland, A., Hemingway, R. D., Hill, J. C., Oglivie, L., & Volk, D. (2003). Evidence-based practice: Beliefs, attitudes, knowledge, and behaviors of physical therapists. *Physical Therapy*, *83*(9), 787-805.

Kasworm, C. (1983). Self-directed learning and lifespan development. *International Journal of Lifelong Education*, *2*(1), 29-46.

Kegan, R. (1980). Making meaning: The constructive-developmental approach to persons and practice. *Personnel and Guidance Journal,* January, 373-379.

Kegan, R. (1982). *The evolving self.* Cambridge, MA: Harvard University Press.

Kegan, R. (1994). *In over our heads.* Cambridge, MA: Harvard University Press.

Kegan, R., & Lahey, L. (2000). *How the way we talk can change the way we work: Seven languages of transformation.* San Francisco: Jossey-Bass Pfeiffer.

Kessenich, C. R., Guyatt, G. H., & DiCenso, A. (1997). Teaching nursing student's evidence-based nursing. *Nurse Educator*, *22*(6), 25- 29.

Kline, P., & Saunders, B. (1993). *Ten steps to a learning organization.* Arlington, VA: Great Ocean Publishers.

Knapper, C. K., & Cropley, A. J. (2000). *Lifelong learning in higher education*. London: Kogan Page.

Knowles, M. (1973). *The adult learner: A neglected species*. Houston: Gulf Publishing Company.

Knowles, M. (1975). *Self-directed learning.* New York: Association Press.

Knowles, M. S. (1985). Applications in continuing education for the health professions. *Mobius, 5* (2), 80-100.

Leung, G. M. Johnston, J. M., Wong, I. O. L., Ho, L. M., & Lam, T. H. (2003). Randomized controlled trial of clinical decision support tools to improve learning of evidence based medicine in medical students. *British Medical Journal, 327*, 1-10 Retrieved November 7, 2003, from http://wwwbmj.com.

Lewis-Beck, M. S. (1980). *Applied regression: An introduction.* London: Sage Publications.

Linares, A. Z. (1999). Learning styles of students and faculty of selected health care professions. *Journal of Nursing Education, 38*(9), 407-414.

Lipshitz, R., & Popper, M. (2000). Organization learning in a hospital [Electronic version]. *The Journal of Applied Behavioral Science, 9*, 345-361.

Long, H. B. (1987). Item analysis of Guglielmino's self-directed learning readiness scale. *International Journal of Lifelong Education*, *6*(4), 331-336.

Long, H. B., & Agyckum, S. K. (1988). Self-directed learning readiness: Assessment and validation. In H. B. Long and Associates (Eds.), *Self-directed learning: Application and theory* (pp. 253-266). Athens, GA: Adult Education Department of The University of Georgia.

Long, H. B., & Walsh, S. M. (1992). An analysis of a modified form of Guglielmino's self-directed learning readiness scale. In H. B. Long (Ed.), *Self-directed learning: Application and research* (pp. 189-207). Norman, OK: Oklahoma Research Center for Continuing Professional and Higher Education of the University of Oklahoma.

Lusardi, M. M., LeVangie, P. K., & Fein, B. D. (2002). A problem-based learning approach to facilitate evidence-based practice in entry-level education. *Journal of Prosthetics and Orthotics, 14*(2), 40-50.

Manning, P. R., & Debakey, L. (1992). Lifelong learning tailored to individual clinical practice. *Journal of the American Medical Association, 268*(9), 1135-1136.

March, J. G. (1991). Exploration and exploitation in organization learning. *Organization Science, 2*(1), 71-86.

Marquart, M. J. (1996). *Building the learning organization.* New York: McGraw-Hill.

Marquardt, M., & Reynolds, A. (1994). *The global learning organization: Gaining competitive advantage through continuous learning.* Burr Ridge, IL: Irwin Professional Publishing.

Marsick, V. J. (1987). *Learning in the workplace*. New York: Croom Helm.

Marsick, V. J., & Watkins, K. E. (1999). *Facilitating learning organizations*. Brookfield, VT: Gower.

McColl, A., Smith, H., White, P., & Field, J. (1998). General practitioners' perceptions of the route to evidence based medicine: Survey questionnaire. [Electronic version]. *British Medical Journal, 316,* 361-365.

McCune, S. (1988). *A meta-analytic study of adult self-direction in learning: A review of the research from 1977 to 1987. Unpublished doctoral dissertation,* Texas A & M University: College Station, TX.

McCune, S., Guglielmino, L. M., & Garcia, G. (1990). Adult self-direction in learning: A meta-analytic study of research using the self directed learning readiness scale. In H.B. Long (Ed.), *Advances in research and practice in self-directed learning* (pp. 145-146). Norman, OK: Oklahoma Research Center for Continuing Professional and Higher Education of the University of Oklahoma.

McHargue, S. (1999). *Nonprofit organizational learning behaviors and performance study.* Unpublished doctoral dissertation, University of Georgia, Athens.

McHargue, S. (2003). Learning for performance in nonprofit organizations. *Advances in Developing Human Resources, 5*(2), 196-204.

Mead, J. (1998). Developing, disseminating, and implementing clinical guidelines. In T. Bury & J. Mead (Eds.) *Evidence-based healthcare* (pp.162-181). Boston: Butterworth-Heinemann.

Mead, J., & Bury, T. (1998). Making evidence-based healthcare happen. In T. Bury & J. Mead (Eds.), *Evidence-based healthcare* (pp. 211-226). Boston: Butterworth-Heinemann.

Mezirow, J. (1981). A critical theory of adult learning and education. *Adult Education Quarterly, 32*(1), 3-24.

Michaels, E. (1982). Evaluation and research in physical therapy. *Physical Therapy, 62,* 828-834.

Mildon, D., Courtright, P., Rollins, D., Blicker, & Law, F. (2001). Knowledge, attitudes and practices regarding evidence-based medicine and outcome assessment: a survey of British Columbia cataract surgeons. *Canadian Journal of Ophthalmology, 36,* 323-31.

Miller, L. (1994, September 22). One bum knee meets five physical therapists. *The Wall Street Journal,* Retrieved December 5, 2001, from http://ptg.djnr.com/ccroot/asp/publib/story.asp.

Mowatt, G., Grimshaw, J. M., Davis, D. A., & Mazmanian, P. (2001). Getting evidence into practice: The work of the Cochrane effective practice and organization of care group. *Journal of Continuing Education in the Health Professions, 21*, 55-60.

Nunnally, J. C. (1970). *Introduction to psychological measurement*. New York: McGraw Hill.

O'Brien, M. A. (2001) Keeping up-to-date: Continuing education, practice improvement strategies, and evidence-based physiotherapy practice. *Physiotherapy Theory and Practice 17*, 187-199.

Oddi, L. F. (1984). *Development of an instrument to measure self-directed continuing learning.* Unpublished doctoral dissertation, Northern Illinois University, Dekalb, Illinois.

Oddi, L. F., Ellis, A. J., & Robertson J. E. A., (1990). Construct validation of the Oddi continuing learning inventory. *Adult Education Quarterly, 40*(3), 139-145.

Olantunbosun, O. A. (1998). Survey of physician attitudes toward evidence-based medicine in reproductive health: A questionnaire survey. *British Medical Journal, 316,* 366.

Osler, W. (1906). *Aequanimitas with other addresses to medical students, nurses and practitioners of medicine.* Philadelphia: P. Blakiston's Son & Company.

Oxman, A. D., Sackett, D. L., & Guyatt, G. H. (1993). User's guides to the medical literature: How to get started. *Journal of the American Medical Association, 370*(17), 2003-2005.

Oxman, A. D. Thompson, M. A. Davis, D. A., & Haynes, B. (1995). No magic bullets: A systematic review of 102 trials of interventions to improve professional practice. *Canadian Medical Association Journal, 153*(10), 1423-1430.

Paxon, M. C. (1995). Increasing survey response rates: Practical instructions from the total design method. [Electronic version]. *Cornell Hotel and Restaurant Administration Quarterly,36* (4), 66-72.

Peat, M. (1981). Physiotherapy: Art or science? *Physiotherapy Canada, 33*(3), 170-176.

Pollock, A. S., Legg, L., Langhorne, P., & Sellars, C. (2000). Barriers to achieving evidence-based stroke rehabilitation. [Electronic version]. *Clinical Rehabilitation, 14*(6), 612-712.

Rao, G., Robbins, G. W., & Roberts, R. G. (1998). *Evidence-based medicine. Monograph, edition No. 225, home study assessment study program.* Kansas City, MO: American Academy of Family Physicians.

Raz, P., Jensen, G. M., Walter, J., & Drake, L. M. (1991). Perspectives on gender and professional issues among female physical therapists. *Physical Therapy, 71*(7), 530-539.

Research and Development Center for Teacher Education. (1981). *CBAM Project*. Austin, TX.

Richards, R. K. (1986). Physician's self-directed learning. *Mobius, 6*(4), 1-14.

Robertson, V. J., & Baker, K. G. (2001). A review of therapeutic ultrasound: Effectiveness studies. *Physical Therapy, 81*(7), 1339-1350.

Rogers, E. M. (1983). *The diffusion of innovation* (Rev. ed.). New York: The Free Press.

Rogers, E. M., & Shoemaker F. F. (1971). *Communication of innovations*. New York: The Free Press.

Rosenberg, W. & Donald, A. (1995). Evidence based medicine: an approach to clinical problem solving [Electronic version]. *British Medical Journal, 310*, 1122-126.

Rosswurm, M. A., & Larrabee, J. H. (1999). Model for change to evidence-based practice. *Journal of Nursing Scholarship, 31*(4), 317-322.

Rothstein, J. M. (1997). It's our choice. *Physical Therapy, 77*(8), 800-801.

Rothstein, J. M. (2000). Thirty years later. *Physical Therapy, 80*(1), 6-7.

Rothstein, J. M. (2000). Editor's response. *Physical Therapy, 80*(1), 114-115.

Rothstein, J. M. (2001). Are you financing a sham? *Physical Therapy, 81*(9), 1500-1501.

Rothstein, J. M. (Ed.) (2001). *The guide to physical therapist practice* (2nd ed.). Washington: American Physical Therapy Association.

Sackett, D. L., & Rosenberg, M. C. (1995). On the need for evidence-based medicine. *Journal of Public Health Medicine, 17*(3), 330-334.

Sackett, D. L., Rosenberg, W. M. C., Gray, J. A. M., Haynes, R. B., & Richardson, W. S. (1996). Evidence-based medicine: What it is and what it isn't. *British Medical Journal*, 312, 71-72.

Sackett, D. L., Rosenberg, W. M. C., Gray, J. A. M., Haynes, R. B., & Richardson, W. S. (1997). *Evidence-based medicine: How to practice and teach EBM.* Edinburgh, Scotland: Churchill Livingstone.

Sackett, D. L., Strauss, S., Richardson, W. S., Rosenberg, W. M. C., & Haynes, B. R. (2000). *Evidence-based medicine: How to practice and teach EBM.* Edinburgh, Scotland: Churchill Livingstone.

Salant, P., & Dillman, D. (1994). *How to conduct your own survey.* New York: John Wiley & Sons Inc.

Scalzitti, D. (2001). Evidence-based guidelines: Application to practice. *Physical Therapy, 81*(10), 1622-1628.

Schell, B. A. B. (1994). *The effects of practice context on occupational therapists' clinical reasoning.* Unpublished doctoral dissertation, University of Georgia, Athens.

Schön, D. (1983). *The reflective practitioner*. San Francisco: Josey-Bass.

Selden, G. L. (1998). *Family business as learning organizations an explanatory model of knowledge and financial performance.* Unpublished doctoral dissertation, University of Georgia, Athens.

Senge, P. (1990). *The fifth discipline*. New York: Doubleday/Currency.

Senge, P., Kleiner, A., Roberts, C., Ross, R., Roth, G., & Smith, B. (1994). *The fifth discipline field book.* New York: Doubleday/Currency.

Shaughnessy, A. F. Slawson, D. C., & Bennett, J. H. (1994). Becoming an information master: A guidebook to the medical information jungle. *The Journal of Family Practice, 39*(5), 489-499.

Shaughnessy, A. F., & Slawson, D. C. (1999) Are we providing doctors with the training and tools for life long learning? [Electronic version]. *British Medical Journal, 319,* 1280.

Six, J. E. (1989). The generality of the underlying dimensions of the Oddi continuing learning inventory. *Adult Education Quarterly, 40*(1), 43-51.

Skager, R. (1984). *Organizing schools to encourage self-direction in learners.* New York: UNESCO Institute for Education, Hamburg and Pergamon Press.

Slawson, D. C., Shaughnessy, A. F., & Barry, H. (2001). Which should come first: Rigor or Relevance? [Electronic version]. *The Journal of Family Practice*, *50*(3) 209-210.

Slawson, D. C., Shaughnessy, A. F., & Bennett, J. H. (1994). Becoming a medical information master: Feeling good about not knowing everything. *The Journal of Family Practice*, *38*(5), 505-513.

Slawson, D. C., Shaughnessy, A. F., Newton, W. P., & Douglas, M. (1995, May). Teaching family physicians to be information masters. The 1995 STFM Annual Spring Conference, New Orleans, LA.

Smith, R. (2001). The Future of PT. *REHAB Management*, October, 20-24.

Spear, G. E., & Mocker, D.W. (1984). The organizing circumstance: Environmental determinants in self-directed learning. *Adult Education Quarterly*, *35*(1), 1-10.

Squire, S. (2001). Building a culture of evidence-based care. *Professional Nurse Supplement*, 16 (6), S2.

Squire, S., & Cullen, R. (2001). Clinical governance in action: Part 7: Effective learning. *Professional Nurse*, *16*(4), 1014-1015.

Sta. Maria, R. F. (2000). *Perception of learning culture concerns about the innovation and their influence on use of an on-going innovation in the Malaysian public sector*. Unpublished doctoral dissertation, University of Georgia, Athens.

Sta. Maria, R. F. (2003). Innovation and organizational learning culture in the Malaysian public sector. *Advances in Developing Human Resources, 5*(2), 205-214.

Stocking, B. (1993). Implementing the findings of effective care in pregnancy and childbirth in the United Kingdom. *The Milbank Quarterly, 7(3),* 497-521.

Suny Downstate Medical Center. (2002) *Guide to Research Methods.* Retrieved October 10, 2002 from http://servers.medlib.hscbkyln.edu/ebm/2100.htm.

Swinkels, A., Alabarran, J. W., Means, R. I., Mitchell, T., & Stewart, M. C. (2002). Evidence-based practice in health and social care: Where are we now? *Journal of Interprofessional Care, 16*(4), 335-346.

Tammivaara, J., & Shepard, K. F. (1990). Theory: The guide to clinical practice and research. *Physical Therapy*, *70*(9), 578-582.

Tennant, M. (1992). The staged self-directed learning model. *Adult Education Quarterly, 42*(3), 164-166.

The Clinical Research Agenda Conference Participants. (2000). Clinical research agenda for physical therapy. *Physical Therapy*, *80*(5), 499- 513.

The Philadelphia Panel. (2001). Philadelphia panel evidence-based clinical practice guidelines on selected rehabilitation interventions for low back pain. *Physical Therapy*, *81*(10), 1641-1674.

The Philadelphia Panel. (2001). Philadelphia panel evidence-based clinical practice guidelines on selected rehabilitation interventions for knee pain. *Physical Therapy*, *81*(10), 1675-1700.

The Philadelphia Panel. (2001). Philadelphia panel evidence-based clinical practice guidelines on selected rehabilitation interventions for neck pain. *Physical Therapy*, *81*(10), 1701-1718.

The Philadelphia Panel. (2001). Philadelphia panel evidence-based clinical practice guidelines on selected rehabilitation interventions for shoulder pain. *Physical Therapy, 81*(10), 1719-1730.

Thomas, L., Cullum, N., McColl, E., Rousseau, N., Soutter, J., & Steen, N. (2002). Guidelines in professions allied to medicine. In: *The Cochrane Library*, (1) Oxford: Update software.

Tordoff, C. (1998) From research to practice: A review of the literature. *Nursing Standard, 12*(25), 34-37.

Tough, A. (1971). *The adult's learning projects.* Toronto, Ontario: The Ontario Institute for Studies in Education.

Tough, A. (1979). *The adult's learning projects.* Austin, TX: Learning Concepts.

Turner, P. (2001). Evidence-based practice and physiotherapy in the 1990's. *Physiotherapy Theory and Practice, 17*, 107-121.

Turner, P., & Whitfield, T.W.A. (1997). Physiotherapists' use of evidence-based practice: A cross-national study. *Physiotherapy Research International, 2*, 17-29.

University of North Carolina. (2002). *Evaluating the Evidence*. Retrieved May 25, 2001, from http://www.hsl.unc.edu/ebm/Question.htm.

Vanderkooy, J., Bach, B., Gross, A. (1999). A clinical effort toward maximizing evidence-based practice. *Physiotherapy Canada, Fall*, 273-279.

Ward, D. (2000). Implementing evidence-based practice in infection control. *British Journal of Nursing*, 9 (5), 267-271.

Warren, S. C. & Pierson, F. M. (1994). Comparison of characteristics and attitudes of entry level bachelor's and master's degree students in physical therapy. *Physical Therapy, 74*, 333-348.

Watkins, K. E., & Marsick, V. J. (1992). Building the learning organization: A new role for human resources developers. *Studies in Continuing Education, 14*(2), 115-129.

Watkins, K. E., & Marsick, V. J. (1993). *Sculpting the learning organization*. San Francisco: Jossey-Bass Publishers.

Watkins, K. E., & Marsick, V. J. (1996). *In action: Creating the learning organization*. Alexandria, VA: American Society for Training and Development.

Watkins, K. E., & Marsick, V. J. (1998). *Dimensions of the Learning Organization.*

Watkins, K. E., Yang, B., & Marsick, V. J. (1997). Measuring dimensions of the learning organization. In 1997 Proceedings of the 1997 Academy of Human Resources Development, 543-546.

West, R. F., & Bentley, E. L. (1990). Structural analysis of the self-directed learning readiness scale: A confirmatory factor analysis using LISREL modeling. In H. B. Long (Ed.), *Advances in research and practice in self-directed* learning (pp. 157-180). Norman, OK: Oklahoma Research Center for Continuing Professional and Higher Education of the University of Oklahoma.

Wilkinson, E., Bosanquet, A., Salisbury, C., Hasler, J., & Bosanquet, N. (1999). Barriers and facilitators to the implementation of evidence-based medicine in general practice: A qualitative study. *European Journal of General Practice*, *5*, 66-70.

Wyszewianski, L., & Green, L. (2000). Strategies for changing clinicians' practice patterns a new perspective. *The Journal of Family Practice*, *49*(5), 1-5. Retrieved May 10,2001, from http://jfponline.com/content/2000/0s/jfp_0500_04610asp

Yang, B., Watkins, K. E., & Marsick, V. J. (1998). Examining construct validity of dimensions of the learning organization. In 1998 Proceedings of the 1998 Academy of Human Resources Development, 83-90.

Yang, B., Watkins, K. E., & Marsick, V. J. (2002). *The construct of the learning organization: Dimensions, measurement and validation.* Manuscript submitted for publication.

Young, J., Glaziou, P., & Ward, J. (2001). General practitioners' self rating of skills in evidence based medicine: validation study.[Electronic version]. *British Medical Journal, 324,* 950-951.

APPENDIX A

FACTORS AFFECTING THE PROPENSITY TO ADOPT EVIDENCE-BASED PRACTICE

Factors Affecting the Propensity to Adopt Evidence-Based Practice in Physical Therapy

Section I

We are interested in knowing how you as a physical therapist make your clinical decisions. Please read each of the following items and give us your honest opinion. For each of the items circle the number that best represents your opinion. If you strongly disagree, circle the item one [1]. If you strongly agree, circle the item six [6].

Definitions

Practice guidelines- Systematically developed statements to guide decision making by physical therapists and other health care professionals
Scientific studies- Clinical trials (meta-analyses, systematic reviews, randomized control trials, cohort studies, or case control studies)

	Strongly Disagree ← → Strongly Agree					
1. In making clinical decisions, I value clinical experience more than scientific studies.	1	2	3	4	5	6
2. I am comfortable practicing in ways different from other physical therapists.	1	2	3	4	5	6
3. In making clinical decisions, seeking evidence from scientific studies makes a lot of sense to me.	1	2	3	4	5	6
4. In making clinical decisions, assessing the quality of the research evidence makes a lot of sense to me.	1	2	3	4	5	6
5. I am more likely to change the way I treat a problem when other physical therapists I know are making changes.	1	2	3	4	5	6
6. The opinions of respected practitioners should guide clinical practice.	1	2	3	4	5	6
7. Clinical experience is the most reliable way to know what really works.	1	2	3	4	5	6
8. I am often critical of accepted physical therapy treatments.	1	2	3	4	5	6
9. Patient care should be based where possible on scientific studies rather than the opinions of respected practitioners.	1	2	3	4	5	6
10. Critical appraisal of the literature and its relevance to the patient are not very practical in real patient care.	1	2	3	4	5	6
11. It is not a good idea to use treatments different from other physical therapists I know.	1	2	3	4	5	6
12. Practice guidelines for physical therapy should be based on evidence from scientific studies rather than consensus opinion.	1	2	3	4	5	6
13. Seeking relevant evidence from scientific studies is not very practical in real patient care.	1	2	3	4	5	6
14. My colleagues consider me to be someone who makes my own decisions about treatments.	1	2	3	4	5	6
15. I don't have time to read up on every clinical decision.	1	2	3	4	5	6
16. I follow practice guidelines if they are not too much of a hassle.	1	2	3	4	5	6
17. I am too busy taking care of patients to keep up with the recent literature.	1	2	3	4	5	6
18. I am comfortable doing things differently from the way I was trained.	1	2	3	4	5	6
19. I follow practice guidelines as long as they don't interfere too much with the flow of patients.	1	2	3	4	5	6

Section II

We are interested in knowing how your work environment supports and uses learning. Please respond to each of the following items. For each item, determine the degree to which this is something that is true or is not true of your department/workplace. If the item refers to a practice, which rarely occurs or never occurs, circle the item one [1]. If it is almost always true of your department/workplace, circle the item six [6].

		Almost Never ← → Almost Always					
20.	In my workplace, people help each other learn.	1	2	3	4	5	6
21.	In my workplace, people are given time to support learning.	1	2	3	4	5	6
22.	In my workplace, people are rewarded for learning.	1	2	3	4	5	6
23.	In my workplace, people give open and honest feedback to each other.	1	2	3	4	5	6
24.	In my workplace, when people state their view, they also ask what others think.	1	2	3	4	5	6
25.	In my workplace, people spend time building trust with each other.	1	2	3	4	5	6
26.	In my workplace, teams/groups have the freedom to adapt their goals as needed.	1	2	3	4	5	6
27.	In my workplace, teams/groups revise their thinking as a result of group discussions or information collected.	1	2	3	4	5	6
28.	In my workplace, teams/groups are confident that the organization will act on their recommendations.	1	2	3	4	5	6
29.	My workplace creates systems to measure gaps between current and expected performance.	1	2	3	4	5	6
30.	My workplace makes lessons learned available to all employees.	1	2	3	4	5	6
31.	My workplace measures the results of the time and resources spent on training.	1	2	3	4	5	6
32.	My workplace recognizes people for taking initiative.	1	2	3	4	5	6
33.	My workplace gives people control over the resources they need to accomplish their work.	1	2	3	4	5	6
34.	My workplace supports people who take calculated risks.	1	2	3	4	5	6
35.	My workplace encourages people to think from a global perspective.	1	2	3	4	5	6
36.	My workplace works together with the outside community to meet mutual needs.	1	2	3	4	5	6
37.	My workplace encourages people to get answers from across the organization when solving problems.	1	2	3	4	5	6
38.	In my workplace, leaders mentor and coach those they lead.	1	2	3	4	5	6
39.	In my workplace, leaders continually look for opportunities to learn.	1	2	3	4	5	6
40.	In my workplace, leaders ensure that the organization's actions are consistent with its values.	1	2	3	4	5	6

Section III

We are interested in knowing your perception of yourself as a self-directed learner. Please evaluate each item regarding the degree the item measures a characteristic of yourself. If you strongly disagree, circle the item one [1]. If you strongly agree, circle the item six [6].

	Strongly Disagree ← → Strongly Agree					
41. I manage my time well.	1	2	3	4	5	6
42. I am self-disciplined.	1	2	3	4	5	6
43. I am organized.	1	2	3	4	5	6
44. I set strict time frames.	1	2	3	4	5	6
45. I have good management skills.	1	2	3	4	5	6
46. I am methodical.	1	2	3	4	5	6
47. I am systematic in my learning.	1	2	3	4	5	6
48. I set specific times for my study.	1	2	3	4	5	6
49. I solve problems using a plan.	1	2	3	4	5	6
50. I prioritize my work.	1	2	3	4	5	6
51. I want to learn new information.	1	2	3	4	5	6
52. I enjoy learning new information.	1	2	3	4	5	6
53. I have a need to learn.	1	2	3	4	5	6
54. I enjoy a challenge.	1	2	3	4	5	6
55. I enjoy studying.	1	2	3	4	5	6
56. I critically evaluate new ideas.	1	2	3	4	5	6
57. I prefer to set my own goals.	1	2	3	4	5	6
58. I like to make decisions for myself.	1	2	3	4	5	6
59. I am responsible for my own decisions/actions.	1	2	3	4	5	6
60. I am in control of my life.	1	2	3	4	5	6
61. I have high personal standards.	1	2	3	4	5	6
62. I prefer to set my own learning goals.	1	2	3	4	5	6

Section IV

Background information
For items 63-65 circle the item that best describes you.

63. What is your gender?
1 female
2 male

64. What is your race/ethnicity?
1 White
2 Black/African American
3 American Indian/ Alaska Native
4 Asian
5 Native Hawaiian and other Pacific Islander
6 Hispanic or Latino
7 Other

65. Highest Degree held
1 Bachelor's
2 Masters
3 Doctorate in Physical Therapy
4 Other Doctorate
5 Other (Specify)_____

66. Employment setting in which you spend the majority of your time.
1 Outpatient Facility
2 Hospital
3 Home Health Agency
4 Skilled Nursing Facility /Extended Care Facility
5 School System
6 Academic Institution
7 Sub-acute Rehab Hospital
8 Other (Specify)_____

67. What year were you born?_____

68. How many years have you been a licensed physical therapist? _____

Thank you for your participation. Your answers are greatly appreciated.

APPENDIX B

CLINICAL DECISION MAKING FOR PHYSICAL THERAPISTS

Clinical Decision Making for Physical Therapists

Section I

We are interested in knowing how you as a physical therapist make your clinical decisions. Please read each of the following items and give us your honest opinion. For each of the items circle the number that best represents your opinion. If you strongly disagree, circle the item a one [1]. If you strongly agree, circle the item a six [6].

Definitions

Practice guidelines- Systematically developed statements to guide decision making by physical therapists and other health care professionals
Scientific studies- Clinical trials (meta-analyses, systematic reviews, randomized control trials, cohort studies, or case control studies)

		Strongly Disagree ←					→ Strongly Agree
1.	In making clinical decisions, I value clinical experience more than scientific studies.	1	2	3	4	5	6
2.	I am comfortable practicing in ways different from other physical therapists.	1	2	3	4	5	6
3.	In making clinical decisions, seeking evidence from scientific studies makes a lot of sense to me.	1	2	3	4	5	6
4.	In making clinical decisions, assessing the quality of the research evidence makes a lot of sense to me.	1	2	3	4	5	6
5.	I am more likely to change the way I treat a problem when other physical therapists I know are making changes.	1	2	3	4	5	6
6.	The opinions of respected practitioners should guide clinical practice.	1	2	3	4	5	6
7.	Clinical experience is the most reliable way to know what really works.	1	2	3	4	5	6
8.	I am often critical of accepted physical therapy treatments.	1	2	3	4	5	6
9.	Patient care should be based where possible on scientific studies rather than the opinions of respected practitioners.	1	2	3	4	5	6
10.	Critical appraisal of the literature and its relevance to the patient are not very practical in real patient care.	1	2	3	4	5	6
11.	It is not a good idea to use treatments different from other physical therapists I know.	1	2	3	4	5	6
12.	Practice guidelines for physical therapy should be based on evidence from scientific studies rather than consensus opinion.	1	2	3	4	5	6
13.	Seeking relevant evidence from scientific studies is not very practical in real patient care.	1	2	3	4	5	6
14.	My colleagues consider me to be someone who makes my own decisions about treatments.	1	2	3	4	5	6
15.	I don't have time to read up on every clinical decision.	1	2	3	4	5	6
16.	I follow practice guidelines if they are not too much of a hassle.	1	2	3	4	5	6
17.	I am too busy taking care of patients to keep up with the recent literature.	1	2	3	4	5	6
18.	I am comfortable doing things differently from the way I was trained.	1	2	3	4	5	6
19.	I follow practice guidelines as long as they don't interfere too much with the flow of patients.	1	2	3	4	5	6

Section II

We are interested in knowing how your work environment affects your clinical decisions. Please respond to each of the following items. For each item, determine the degree to which this is something that is true or is not true of your department/workplace. If the item refers to a practice, which rarely occurs or never occurs, circle the item a one [1]. If it is almost always true of your department/workplace, circle the item a six [6].

		Almost Never					Almost Always
20.	In my workplace, people help each other learn.	1	2	3	4	5	6
21.	In my workplace, people are given time to support learning.	1	2	3	4	5	6
22.	In my workplace, people are rewarded for learning.	1	2	3	4	5	6
23.	In my workplace, people give open and honest feedback to each other.	1	2	3	4	5	6
24.	In my workplace, when people state their view, they also ask what others think.	1	2	3	4	5	6
25.	In my workplace, people spend time building trust with each other.	1	2	3	4	5	6
26.	In my workplace, teams/groups have the freedom to adapt their goals as needed.	1	2	3	4	5	6
27.	In my workplace, teams/groups revise their thinking as a result of group discussions or information collected.	1	2	3	4	5	6
28.	In my workplace, teams/groups are confident that the organization will act on their recommendations.	1	2	3	4	5	6
29.	My workplace creates systems to measure gaps between current and expected performance.	1	2	3	4	5	6
30.	My workplace makes lessons learned available to all employees.	1	2	3	4	5	6
31.	My workplace measures the results of the time and resources spent on training.	1	2	3	4	5	6
32.	My workplace recognizes people for taking initiative.	1	2	3	4	5	6
33.	My workplace gives people control over the resources they need to accomplish their work.	1	2	3	4	5	6
34.	My workplace supports people who take calculated risks.	1	2	3	4	5	6
35.	My workplace encourages people to think from a global perspective.	1	2	3	4	5	6
36.	My workplace works together with the outside community to meet mutual needs.	1	2	3	4	5	6
37.	My workplace encourages people to get answers from across the organization when solving problems.	1	2	3	4	5	6
38.	In my workplace, leaders mentor and coach those they lead.	1	2	3	4	5	6
39.	In my workplace, leaders continually look for opportunities to learn.	1	2	3	4	5	6
40.	In my workplace, leaders ensure that the organization's actions are consistent with its values.	1	2	3	4	5	6

Section III

We are interested in knowing how your perception of yourself as a self-directed learner affects how you make clinical decisions. Please evaluate each item regarding the degree the item measures a characteristic of yourself. If you strongly disagree, circle the item a one [1]. If you strongly agree, circle the item a six [6].

	Strongly Disagree ← → Strongly Agree					
41. I manage my time well.	1	2	3	4	5	6
42. I am self-disciplined.	1	2	3	4	5	6
43. I am organized.	1	2	3	4	5	6
44. I set strict time frames.	1	2	3	4	5	6
45. I have good management skills.	1	2	3	4	5	6
46. I am methodical.	1	2	3	4	5	6
47. I am systematic in my learning.	1	2	3	4	5	6
48. I set specific times for my study.	1	2	3	4	5	6
49. I solve problems using a plan.	1	2	3	4	5	6
50. I prioritize my work.	1	2	3	4	5	6
51. I want to learn new information.	1	2	3	4	5	6
52. I enjoy learning new information.	1	2	3	4	5	6
53. I have a need to learn.	1	2	3	4	5	6
54. I enjoy a challenge.	1	2	3	4	5	6
55. I enjoy studying.	1	2	3	4	5	6
56. I critically evaluate new ideas.	1	2	3	4	5	6
57. I prefer to set my own goals.	1	2	3	4	5	6
58. I like to make decisions for myself.	1	2	3	4	5	6
59. I am responsible for my own decisions/actions.	1	2	3	4	5	6
60. I am in control of my life.	1	2	3	4	5	6
61. I have high personal standards.	1	2	3	4	5	6
62. I prefer to set my own learning goals.	1	2	3	4	5	6

Section IV

Background information

63. What year were you born?____

64. What is your gender? ____

65. What is your race/ethnicity? _____

66. Entry level Physical Therapy Degree
____Bachelor's
____Masters
____Doctorate
____Other (Specify)

67. How many years have you been a licensed physical therapist? ____

68. Clinical Facility Please check your **main place of work.**

____A. Acute Care Hospital
____B. Sub-acute Rehab Hospital
____C. Hospital-based Outpatient Facility
____D. Private Practice Outpatient Facility
____E. Skilled Nursing Facility /Extended Care Facility
____F. Home Health Agency
____G. School System
____H. Health and Wellness Facility
____I. Research Center
____J. Industry
____K. Physical Therapy Education Program
____L. Physical Therapy Assistant Education Program
____J. Other (Specify)_____

69. How many physical therapists are employed at your main place of work? ____

Thank you for your participation. Your answers are greatly appreciated.

The questionnaire is based on modified versions of the works listed below.

Fisher, M., King, J., & Tague, G. (2001). Development of a self-directed learning readiness scale for nurse education. *Nurse Education Today, 21,* 516-525.

Green, L.A., Gorenflo, D.W. & Wyszewianski, L. (2002). Validation of an instrument for selecting interventions to change physician practice patterns. A Michigan consortium for Family Practice Research Study.

Yang, B., Watkins, K.E. & Marsick, V.J. (2002). *The construct of the learning organization: Dimensions, measurement and validation.* Manuscript submitted for publication.

APPENDIX C

FIRST LETTER

[University of Georgia Letterhead]

March 21, 2003

Dear (personal salutation):

As a practicing physical therapist, you have more than likely heard and read about the movement toward evidence based practice in physical therapy. Questions about evidence based practice abound. Is it used in day-to-day clinical decision making by physical therapists? Does your workplace environment foster a culture that facilitates the adoption of evidence based practice? Are there personal characteristics that make it more likely for you to adopt evidence based practice? Answering these questions will help our profession understand what is needed in the workplace to foster evidence based practice. We plan to submit the results of this research project, "Factors Affecting the Propensity to Adopt Evidence Based Practice in Physical Therapy," to *Physical Therapy* for possible publication.

We need your help in answering these extremely important questions. Your name was randomly selected from a list of all licensed physical therapists in the state of Georgia. In order for the results to truly represent physical therapists licensed in the state of Georgia, it is important that each survey be completed and returned in the envelope provided.

In appreciation for your participation we have enclosed a dollar bill to treat you to your favorite drink while you fill out the survey. Please accept this small token of thanks. Participants who return the completed survey by April 21, 2003 will have a chance to win $250.00 in a drawing. Thank you in advance for your opinions! Your participation means this research project will be successful and useful to the profession of physical therapy.

If you have any questions concerning this survey, please contact my major professor, Laura Bierema, Ed.D., Assistant Professor, at lbierema@coe.uga.edu or 706-542-6174 or me at bridgtr@aol.com or 770-394-6581.

Sincerely,

Patricia Bridges, M.M.Sc., P.T.
Project Director
Department of Adult Education

APPENDIX D

POST CARD

Dear Colleague:
Last week a survey seeking your opinion about factors that may affect the adoption of evidence based practice by physical therapists was mailed to you. If you have already completed and returned the survey to us, please accept our sincere thanks.
If not, please do so today. We are especially grateful for your help because we believe your response will be very useful to the profession of physical therapy.

If you did not receive a survey, or if it was misplaced, please call us collect at 770-394-6581 and we will get another one in the mail to you today.

Sincerely,

Patricia Bridges, PT, MMSc
Project Director
Department of Adult Education
770-394-6581

APPENDIX E

FINAL LETTER

[University of Georgia Letterhead]

April 30, 2003

Dear (personal salutation):

About five weeks ago, we wrote to you seeking your opinion about clinical decision making in physical therapy. As of today we have not received your completed survey.
As a physical therapist myself, I understand you may not have had time to complete it. However, I really believe that the enclosed study has the potential to make a difference to all of us in the practice of physical therapy.

The study is being conducted to determine how the workplace environment and an individual's perception of themselves as a self-directed learner affect their propensity to adopt evidence-based practice. We are writing to you again because the projects' usefulness depends on receiving a survey from each physical therapist. You were chosen through a random sampling process in which every physical therapist that is licensed in the state of Georgia had an equal chance of being selected. In order for the information to be truly representative, it is essential that each physical therapist in the sample return their survey.

Please help us by completing the enclosed questionnaire and returning it in the self-addressed stamped envelope by June 2, 2003. I would be happy to answer any questions you have about the study. Please call me at 770-394-6581 or e-mail me at bridgtr@aol.com.

Your participation is greatly appreciated. I look forward to your response.

Sincerely,

Patricia H. Bridges, P.T.
Project Director
Department of Adult Education
770-394-6581

APPENDIX F

INTERCORRELATION OF SCALE INDEPENDENT VARIABLES

Intercorrelation of Scale Independent Variables

Variable	SM	DL	SC	NC	P	CL	DI	TL	ES	SCN	E	PL
Self-management (SM)		.35**	.44**	.10**	.15**	.16**	.15**	.21**	.23**	.17**	.21**	.19**
Desire for Learning (DL)	.35**		.54**	.28**	.27**	.27**	.21**	.21**	.18**	.26**	.22**	.25**
Self-control (SC)	.44**	.54**		.29**	.13**	.14**	.15**	.19**	.13**	.20**	.18**	.22**
Nonconformity (NC)	.10**	.28**	.29**		.20**	.02	.00	.00	.02	.10**	.07	.06
Practicality (P)	.15**	.27**	.13**	.20**		.15**	.05**	.12**	.10**	.10**	.14**	.10**
Continuous Learning (CL)	.16**	.27**	.14**	.02**	.15**		.67**	.63**	.60**	.66**	.63**	.67**
Dialogue and Inquiry (DI)	.15**	.20**	.15**	.01	.04	.67**		.65**	.47**	.58**	.56**	.60**
Team Learning (TL)	.21**	.21**	.19**	.00	.12**	.63**	.65**		.60**	.65**	.67**	.67**
Embedded System (ES)	.23**	.18**	.13**	.02	.10**	.60**	.47**	.60**		.66**	.63**	.59**
System Connection (SCN)	.17**	.26**	.20**	.10**	.10**	.66**	.58**	.65**	.66**		.75**	.72**
Empowerment (E)	.21**	.22**	.18**	.07	.14**	.63**	.56**	.67**	.63	.75**		.72**
Provide Leadership (PL)	.19**	.25**	.22**	.06	.10**	.67**.	.60**	.67**	.59**	.72**	.72**	

** Correlation is significant at the .01 level

APPENDIX G

LIST OF OTHER RACES

List of Other Races

Identification Number	Wrote
99.	White/Asian
172.	White/Black/African American
432.	Mix White/Hispanic
475.	Caucasian
708.	Israeli
730.	Asian American
829.	Black/African American/Hispanic
956.	White/French Canadian/European American
984.	Jamaican
1012.	Human
1069.	East Indian and Canadian
1284.	Mixed
1302.	American

APPENDIX H

LIST OF OTHER HIGHEST DEGREES HELD

List of Other Highest Degrees Held

Identification Number	Wrote
182.	Certificate of Physical Therapy
544.	Certificate of Physical Therapy
608.	Certificate of Physical Therapy
823.	Diploma in Physical Therapy
836.	Diploma in Physical Therapy
878.	Certificate of Physical Therapy
1101.	Certificate of Physical Therapy
1183.	Certificate of Physical Therapy
1240.	Fellow (post graduate)

APPENDIX I

LIST OF OTHER PLACES OF EMPLOYMENTS

List of Other Places of Employments

Identification Number	Wrote
126.	Contract services
177.	M.D. owned private practice
218.	Community Service Center for mentally retarded consumers
245.	Pediatric contractor to home/day care
260.	Home care independent contractor pediatrics
271.	Onsite industrial
293.	Early intervention (0-3)
298.	Pediatrics private practice
312.	Physical therapist for a theatre company
317.	Pediatric therapist practicing in a natural environment
319.	Self-employed in home pediatric therapy
320.	Private practice with emphasis on early intervention
326.	Early intervention
331.	Hippotherapy, aquatic therapy, natural environment
386.	Private office
388.	Private office
393.	Onsite Industrial
408.	Outpatient pediatric home health
471.	Pediatric home health
522.	Early intervention program (home based, office in hospital)
636.	Outpatient pediatric rehab
676.	Home-based early intervention as a self-employed independent practitioner
686.	Ice hockey rink/training room
731.	Contract private practice
768.	Home-based early intervention 0-3 years natural environment
772.	PRN part time
776.	Natural environment (Babies Can't Wait)
801.	Pediatric-early intervention
820.	Independent contractor to home health agencies, hospitals, rehab facilities, and private practices
825.	Contract pediatric aquatics and pediatric home visits
836.	Short term specialized in patient center
881.	Hippotherapy Program and Babies can't wait
882.	Industrial orthopedics
957.	Pediatrics
962.	Pediatrics early intervention
1017.	Early intervention
1046.	Worker's comp/industrial
1070.	Babies Can't Wait Medicaid program
1104.	Pediatric out patient and home health
1295.	Community center serving individuals with developmental delays

APPENDIX J

LIST OF OTHER CATEGORIES IN WHICH PHYSICAL THERAPISTS SPEND THEIR TIME

List of Other Categories in which Physical Therapists Spend Their Time

Identification Number	Wrote
15.	Paperwork
60.	Paperwork
65.	Documentation
91.	Travel
93.	Paperwork
116.	Teaching
231.	Increase in education when mentoring a student
232.	Writing, publishing P.T. related material
263.	Documentation, miscellaneous office responsibilities
277.	Hospital meetings, paperwork
280.	Paperwork, documentation, billing time
293.	Paperwork/meetings
330.	Travel, indirect service-instruction of school staff, documentation
372.	Managing fitness center, cardiac rehab and SLP department and program development
393.	Ergonomics
401.	Injury prevention
406.	Paperwork
415.	Various documentation
480.	Paperwork
497.	Paperwork
506.	Travel
508.	Documentation
509.	Paperwork
546.	Documentation
569.	Quality assurance
573.	Marketing
580.	Paperwork/travel time related to direct patient care
587.	Marketing
593.	Note writing, meeting with families, attending IFSPs, meeting with therapists I supervise
633.	Military duties
650.	Paperwork
686.	Preparation for practice/games
700.	Office paperwork
733.	Paperwork
743.	Paperwork
747.	Teaching
765.	Documentation
801.	Driving
802.	Equipment construction, repair, adaptation etc.
803.	Outside projects (work related)
820.	Business management
829.	Paperwork/meetings
841.	Departmental and hospital meetings including safety
852.	Marketing
859.	Community resources

Listing of Other Categories in which Physical Therapists Spend Their Time (continued)

Identification Number	Wrote
861.	Paperwork
881.	Care of horses
886.	Paperwork
896.	Communication with doctors, employees, case managers, etc.
908.	Paperwork
909.	Marketing
922.	Community resources
925.	Paperwork, meetings
938.	Documentary photography
953.	Paperwork
956.	Paperwork
961.	Travel
964.	Paperwork
977.	Paperwork
979.	Documentation
992.	Documentation
1008.	Marketing
1012.	Paperwork related to patient care
1025.	Documentation
1028.	Marketing, observing surgery, meeting with doctors
1048.	Internet National Institute of Health research
1072.	Family education/support, equipment, indirect patient care issues, rounds/teams/staffing
1090.	Business management
1137.	Paperwork
1141.	Paperwork
1157.	Documentation
1205.	Paperwork
1207.	In house staff planning, organizing
1214.	Community
1226.	Writing
1227.	Discussing discharge planning
1282.	Paperwork
1301.	Documentation
1309.	Documentation