Validation of the Evidence-based Practice Confidence (EPIC) Scale among Occupational Therapists

by

Julie Helene Clyde

A thesis submitted in conformity with the requirements for the degree of MSc
Graduate Department of Rehabilitation Science
University of Toronto

© Copyright by Julie Clyde 2014
Validation of the Evidence-based Practice Confidence (EPIC) Scale among Occupational Therapists

Julie Clyde, MSc 2014

Graduate Department of Rehabilitation Science, University of Toronto

Abstract

The objective of this study was to examine the reliability, floor and ceiling effects and construct validity of the evidence-based practice confidence (EPIC) scale among occupational therapists (OTs). A repeated measures study involving a baseline and a follow-up mail survey was conducted. One hundred and twenty-six OTs completed the baseline EPIC scale and construct validity questionnaire and 79 completed the scale at retest. Test-retest reliability, estimated using the intraclass correlation coefficient (ICC), was 0.92 (95% confidence interval (CI), 0.88-0.95). The minimal detectible change at the 95% confidence level (MDC95) was 4.6 %points. Internal consistency, estimated using Cronbach’s α, was 0.91 (95% CI 0.89-0.93). No floor or ceiling effect was observed. Total EPIC scores were significantly associated with holding a masters/doctoral degree (p<0.001), receiving academic training in EBP (p=0.04), EBP knowledge and skill, searching (p=0.04), reading (p=0.01), and using research findings (p=0.02) in clinical decision-making, and EBP knowledge/skill (ρ=0.21, p=0.02).

Key words: evidence-based practice, self-efficacy, validity, reliability, validation studies, questionnaire, evaluation studies, occupational therapists
Acknowledgments

I would like to express my sincere gratitude to my primary thesis supervisor, Dr. Nancy Salbach, for her consistent support, encouragement, guidance and patience over the past 5 years. You have always been considerate of my unique circumstances as a part-time master’s student and patient with my demanding schedule. I would also like to thank my co-supervisor, Dr. Dina Brooks for your expertise, invaluable feedback and constant support. Thank you also to Dr. Jill Cameron for serving as my Program Advisory Committee member and for your interest in my research. You have challenged me to think critically and have provided insightful suggestions. Many thanks to Pam Takhar for your administrative support. My research would not have been possible without your help.

A special thanks to my husband and children for being so supportive of my research and for the sacrifices you have made on my behalf over the past 5 years. Furthermore, I would like to thank all the occupational therapists who volunteered their time to participate in this research.

Finally, I would like to thank the Office of Continuing Education and Professional Development, Faculty of Medicine, at the University of Toronto for their generous funding.
# Table of Contents

Abstract .......................................................................................................................................................... ii  
Acknowledgements ........................................................................................................................................ iii  
List of Tables .................................................................................................................................................. vi  
List of Abbreviations ...................................................................................................................................... vii  
List of Figures ................................................................................................................................................ ix  
List of Appendices .......................................................................................................................................... x  
Chapter 1 ....................................................................................................................................................... 1  
   Introduction .................................................................................................................................................... 1  
Chapter 2 ....................................................................................................................................................... 4  
   Literature Review ......................................................................................................................................... 4  
      Evidence-base Practice Framework .................................................................................................................. 4  
      Steps of EBP ................................................................................................................................................ 4  
      Expectations of EBP in the Professional of Occupational Therapy ............................................................... 6  
      Implementation of EBP in Occupational Therapy ............................................................................................ 7  
      Factors Influencing Engagement in EBP .......................................................................................................... 7  
      Overview of Self-Efficacy Theory ...................................................................................................................... 9  
      Sources of Self-efficacy Information ................................................................................................................ 11  
      Factors Associated with Self-efficacy ............................................................................................................... 14  
      Evaluation of Self-efficacy to Implement EBP .................................................................................................. 16  
      Evidence-based Practice Confidence (EPIC) Scale .......................................................................................... 17  
      Assessing the Methodological Quality of Studies on Measurement Properties ........................................... 19  
      Relevance to Occupational Therapy ............................................................................................................ 20  
      Research Purpose and Objectives .................................................................................................................. 21  
Chapter 3 ....................................................................................................................................................... 23  
   Abstract ......................................................................................................................................................... 24  
   Introduction ..................................................................................................................................................... 26  
   Method ............................................................................................................................................................. 28  
      Overview of Study Design ............................................................................................................................... 28  
      Participants and Sampling ............................................................................................................................... 29  
      Recruitment ................................................................................................................................................... 29  
      Data Collection ............................................................................................................................................. 30  
      Analysis ........................................................................................................................................................... 32  
      Sample Size .................................................................................................................................................. 34  
   Results ............................................................................................................................................................ 35  
      Test-retest Reliability and Measurement Error ............................................................................................... 38  
      Internal Consistency ....................................................................................................................................... 39  
      Floor and Ceiling Effects ............................................................................................................................... 39  
      Known Groups Construct Validity ................................................................................................................... 40  
   Discussion ...................................................................................................................................................... 41
Discussion........................................................................................................41
Limitations.........................................................................................................45
Conclusion.........................................................................................................46
Implications for Occupational Therapy Practice.............................................47
Key Messages....................................................................................................47

Chapter 4.........................................................................................................48
Summary and Conclusion.................................................................................48
  Summary...........................................................................................................48
  Test-retest Reliability and Measurement Error.............................................48
  Floor and Ceiling Effects..............................................................................49
  Known Groups Construct Validity.................................................................49
    Education and Training Experiences..........................................................50
    Behaviour....................................................................................................51
    Knowledge and Skill....................................................................................52
  Sample Characteristics..................................................................................56
  Study Strengths..............................................................................................56
  Future Research.............................................................................................57
  Conclusion.......................................................................................................57

References.......................................................................................................59

Appendices.......................................................................................................72
List of Tables

Table 1: Theoretical Domains Framework, Domain Definition and Constructs

Table 2: Characteristics of Study Participants and their Practice

Table 3: Test-retest Reliability (n=79)

Table 4: Hypothesis Testing for Known Groups Construct Validation (n=126)

Table 5: Cross-tabulation of Evidence-based Practice Confidence (EPIC) and Adapted Fresno Test of Competence in Evidence-based Practice (AFT) Scores (n=108)
List of Abbreviations

ACOTRO: Association of Canadian Occupational Therapy Regulatory Organizations

ACOTUP: Association of Canadian Occupational Therapy University Programs

AFT: Adapted Fresno Test of Competence in Evidence-based Practice

CAOT: Canadian Association of Occupational Therapists

CCAC: Community Care Access Centre

CREATE: Classification Rubric for EBP Assessment Tools in Education Framework

COSMIN: Consensus-based Standards for the Selection of Health Measurement Instruments

COTO: College of Occupational Therapists of Ontario

CI: Confidence Interval

EPIC scale: Evidence-based Practice Confidence scale

EBP: Evidence-based Practice

ICC: Intraclass Correlation Coefficient

IQR: Interquartile Range

MCID: Minimal Clinically Important Difference

MDC$_{90}$: Minimal Detectable Change at the 90% Confidence Level

MDC$_{95}$: Minimal Detectible Change at the 95% Confidence level

OSCE: Observed Structured Clinical Examination

OT: Occupational Therapist

PAC: Presidents' Advisory Committee
PICOT: Population, Intervention, Comparison, Intervention and Time

%points: Percentage Points

SD: Standard Deviation

SEM: Standard Error of Measurement
List of Figures

Figure 1: Components of Bandura’s Self-efficacy Theory

Figure 2: Sampling Results for Mail Survey
List of Appendices

Appendix A: Evidence-based Practice Confidence (EPIC) scale

Appendix B: Adapted Fresno Test of Competence in Evidence-based Practice (AFT)

Appendix C: Letter to Participants

Appendix D: Eligibility Form

Appendix E: Socio-demographic and Practice Information

Appendix F: Test-retest Letter to Participants

Appendix G: EBP Education Questionnaire

Appendix H: Ethics Approval from the University of Toronto

Appendix I: Follow up Letter to Participants

Appendix J: One-page Summary of Study Findings
Chapter 1
Introduction

The need for evidence-based practice (EBP) has resulted from the demand for current, high-quality, effective, and efficient health care services. Evidence-based practice has been defined as the integration of the best available research evidence with clinical expertise and patient values and circumstances. EBP is an approach to clinical decision-making that has gained substantial momentum in recent years and influenced how and what services are being provided by health care professionals. Implementing EBP requires the clinician to have the necessary skills and knowledge to search for, critically appraise and integrate research evidence into their daily clinical decision-making. Occupational therapists (OTs), like many other healthcare professionals, have been urged to provide services that are in line with the best available research evidence. As a result of the increased emphasis on competency and proficiency in EBP, principles supporting EBP are now incorporated into the occupational therapy curricula for entry level OTs. Research has shown, however, that there is a lag in moving research findings into clinical practice among OTs. The gap between actual occupational therapy practice and best practice has been attributed to many factors including lack of organizational support and resources, skill and knowledge to critically appraise the research evidence, and self-efficacy in interpreting, synthesizing and applying the research literature.

Studies across Canada, the United States and the United Kingdom report that self-efficacy to perform specific steps of EBP, including searching for, interpreting, synthesizing and applying research findings, is low among healthcare professionals. Although these findings suggest that self-efficacy beliefs are informative in the context of EBP, a comprehensive evaluation of self-efficacy to engage in EBP has not been undertaken in the profession of occupational therapy. Further investigation of self-efficacy to implement the steps of EBP among OTs may provide educators and researchers with a basis for understanding the impact of self-efficacy beliefs on engagement in EBP and for designing strategies to enhance EBP self-efficacy in this group of professionals.
Self-efficacy, defined as the judgment of one’s ability to organize and execute courses of action required to attain given types of performances, is a key concept in Bandura’s Social Cognitive Theory.\textsuperscript{22} Self-efficacy beliefs are hypothesized to impact on a person’s motivation, thought, affect and decision to engage in or avoid particular activities or settings.\textsuperscript{22} Self-efficacy is not concerned with the skills one has but with the perceived judgment of what one can do with the skills they have gained.\textsuperscript{22} This highlights that self-efficacy is domain specific and should not be considered synonymous with global concepts like self-esteem and self-confidence.\textsuperscript{22}

Fortunately, self-efficacy beliefs are modifiable and four sources of information have been proposed to enhance them.\textsuperscript{22} These sources of information include performance accomplishments, vicarious experience, verbal persuasion and emotional arousal.\textsuperscript{22} *Performance accomplishment* is the most important source of self-efficacy as it is based on a person’s own experiences of success. Success, or mastery, with a specific task increases self-efficacy for that task, whereas frequent failures decrease self-efficacy. *Vicarious experience* is considered an important source of information as observing peers experience success with a specific task within a specific context is postulated to increase one’s own self-efficacy.\textsuperscript{22} *Verbal persuasion,* although weaker than other sources of information, can impact a person’s self-efficacy for a particular task. It refers to providing feedback from credible sources to try to convince people that they have the capabilities to achieve task mastery.\textsuperscript{22} Finally, *emotional arousal* refers to the physiological and emotional states that one experiences during a specific activity. Feelings of stress and anxiety can limit one’s self-efficacy whereas performance is expected to be successful when feelings of angst are minimized.\textsuperscript{22} These sources of information can be useful mechanisms for educators to employ to enhance self-efficacy and potentially bring about behaviour change in healthcare professionals receiving education in EBP.

The main message of Bandura’s self-efficacy theory\textsuperscript{22} is that perceived self-efficacy for a specific activity will influence a person’s decision to engage in the activity, how much effort they will put into completing the task, how long they will persevere when they encounter challenges and the level of success they attain. As a result, self-efficacy is considered to be an important theoretical construct that should be considered when aiming to improve the implementation of EBP among healthcare professionals.\textsuperscript{23,24}
Given the value of self-efficacy as a determinant of behaviour change and an outcome of behavioural interventions, Salbach and Jaglal\textsuperscript{25} developed the 11-item evidence-based practice confidence (EPIC) scale. The EPIC scale was developed to assess confidence in the ability to complete specific steps of EBP and evaluate the effects of interventions on these beliefs.\textsuperscript{25} The EPIC scale is a self-report questionnaire. Each item describes a step in the process of EBP. To complete the scale, the individual rates his/her level of confidence to perform each step on a scale that ranges from 0\% (no confidence) to 100\% (completely confident). Scores on each item are averaged to obtain a summary score that ranges from 0 to 100 percentage points (%points).\textsuperscript{25} The EPIC scale is considered useful in the evaluation of EBP self-efficacy and adequately addresses the five EBP steps, as defined by experts.\textsuperscript{1,26,27}

Researchers have proposed that OTs encounter unique challenges related to EBP that are different from other healthcare professions and that there is a need to utilize discipline-specific instruments that can capture EBP needs and concerns among OTs.\textsuperscript{28} Furthermore, reliability is not a fixed property of a rating scale, but is population-dependent.\textsuperscript{29} Therefore, the psychometric properties of the EPIC scale\textsuperscript{25,30} among OTs need to be explored prior to using it to evaluate the level of EBP self-efficacy, to monitor changes in EBP self-efficacy over time, and as an outcome measure following a proposed intervention among this group of clinicians.\textsuperscript{29}

Therefore, the purpose of this study was to evaluate the psychometric properties of the EPIC scale\textsuperscript{25,30} among OTs. Specifically, the objectives were to estimate test-retest reliability, measurement error, minimum detectible change (MDC), internal consistency, floor and ceiling effects, and known groups construct validity of the EPIC scale for this group of healthcare professionals.
Chapter 2

Literature Review

Evidence-based Practice Framework

The need for evidence-based practice (EBP) has resulted from the need for valid information about diagnosis, prognosis, therapy and prevention, the inadequacy of traditional out-of-date sources of information, and gaps between evidence and practice which brings about differences in practice and quality of care.\textsuperscript{1} Evidence-based practice is an approach to clinical decision-making that has had a major influence on the process and nature of healthcare service delivery.\textsuperscript{14} Evidence-based practice has been defined as the integration of the best available research evidence with clinical expertise and patient values and circumstances in clinical decision-making.\textsuperscript{1} Experts have defined \textit{best research evidence} as high quality, clinically relevant, client-centered research.\textsuperscript{1} The recommendation is to utilize the highest-level of pre-appraised evidence to answer the clinical question (e.g. systematic reviews and meta-analyses are considered a stronger source of evidence than individual studies).\textsuperscript{1} \textit{Clinical expertise} denotes the proficiency to draw on previous clinical experiences to effectively identify with a client’s health conditions, the client’s wishes and expectations and the possible risks and benefits of select treatments.\textsuperscript{1} \textit{Patient values} refer to the client’s distinctive requests, concerns and expectations that must be considered when collaborative clinical decisions are made.\textsuperscript{1} Finally, \textit{patient circumstances} refer to the client’s clinical condition and clinical setting, including employment, residence, family and social supports.\textsuperscript{1} To practice in an evidence-based manner, clinicians must possess the skills and knowledge to identify a knowledge gap, and search, critically appraise and integrate research evidence into their clinical practice to make informed decisions about patient care.\textsuperscript{3} The literature suggests that EBP is a five-step iterative process.\textsuperscript{1,26,27}

Steps of EBP

\textbf{Step 1: Converting the need for information into an answerable question.} In clinical practice, the healthcare practitioner identifies knowledge gaps and poses questions to fill these gaps.\textsuperscript{26} The
search for clinically relevant research is greatly enhanced by asking well-formulated questions. Well-built clinical questions follow the Population, Intervention, Comparison, Outcome and Time (PICOT) form and include information regarding the client population of interest, the main intervention, a comparison intervention, and the clinical outcome about a treatment being considered.\(^1\)

*Step 2: Track down the best evidence with which to answer the question.* This step requires the ability to design and conduct an effective search strategy to answer the clinical question.\(^2^6\) An understanding of the strengths and weaknesses of different sources of evidence is required.\(^2^6\) Experts advise that using traditional text-books should be replaced by seeking evidence-based, regularly updated, online texts and pre-appraised evidence services.\(^1\)

*Step 3: Critically appraise the evidence for its validity and applicability.* Once the literature search is completed, the evidence obtained must be critically appraised for its validity, potential sources of bias, reliability of outcome measures selected, strength of analysis completed, and relevance and applicability to the patient’s circumstances.\(^1\)

*Step 4: Integrate the critical appraisal with clinical expertise and with the patient’s unique biology, values and circumstances in clinical decision-making.* This is a collaborative process that includes the clinician conveying synthesized research information into everyday language with words and grammar that fit the client’s background and comprehension ability.\(^3^1\) The EBP clinician must rely on the experience and expertise acquired during clinical practice and consider whether the available scientific evidence applies to the current client and determine whether the client’s unique perspectives and the available evidence supports the clinical decision to be made.\(^1\)

*Step 5: Evaluate effectiveness and efficiency in executing steps 1-4 and seek ways to improve them in the future.* This final step requires the clinician to self-reflect on his/her personal effectiveness and efficiency in asking answerable questions, searching the research evidence, critically appraising the evidence for its validity and relevance, evaluating skills required for
integrating critical appraisals with clinical expertise and patient preferences. This self-reflection process is followed by pursuing methods to improve the EBP steps for the future.¹,²

**Expectations of EBP in the Profession of Occupational Therapy**

Like most other health professionals, occupational therapists (OTs) are expected to work within an EBP context to increase the efficiency and effectiveness of treatments and, ultimately, patient outcomes.¹⁹,³²-³⁴ Adopting EBP is considered essential to the future credibility and development of the occupational therapy profession.⁴ The 2009 Joint Position Statement on EBP⁵ written by the Canadian Association of Occupational Therapists (CAOT), the Association of Canadian Occupational Therapy University Programs (ACOTUP), the Association of Canadian Occupational Therapy Regulatory Organizations (ACOTRO), and the Presidents' Advisory Committee (PAC), clearly underlines that occupational therapy educational programs are responsible for preparing future clinicians for evidence-based occupational therapy practice and that OTs must continually expand their knowledge base through critical evaluation of relevant research and continuing education. In addition, the translation of research evidence into clinical decision-making is a basic expectation of registered OTs and is embedded in the essential competencies required for clinical practice in Canada, the United States and the United Kingdom.³⁶-³⁸ For example, the essential competencies for practice of occupational therapy in Canada document describes the knowledge, skills and attitudes required for OTs to demonstrate that they are competent to practice occupational therapy in Canada.³⁶ Seven essential competencies are highlighted and include: 1) assumes professional responsibility, 2) thinks critically, 3) demonstrates practice knowledge, 4) utilizes an occupational therapy process to enable occupation 5) communicates and collaborates effectively, 6) engages in professional development, and 7) manages own practice and advocates within systems. The implementation of EBP steps are clearly referred to in three competencies, including *thinks critically, demonstrates practice knowledge* and *engages in professional development*. As occupational therapy is a self-regulated profession, it is the responsibility of the OT to enhance their personal competence through the integration of ongoing learning into practice.³⁶
Implementation of EBP in Occupational Therapy

Given the importance attributed to EBP, many studies have examined the extent to which EBP is employed by OTs. Many studies have found OTs hold a positive view about the concept of EBP; however, there exists a low to moderate level of reference to research evidence in their daily practice. For example, a mail survey of 649 Australian OTs found that respondents were positive about EBP with most (96%) agreeing that EBP is important to occupational therapy, however, only 56% reported using research to make clinical decisions.14 This slow adoption of EBP has also been identified among Canadian OTs, specifically in the application of best practice guidelines in stroke rehabilitation. For example, low identification of critical problems post stroke, such as dysphasia, urinary incontinence, driving, and family support, have been reported among OTs.9,41 Furthermore, a low prevalence of assessment of unilateral spatial neglect15 and low reported use of specific assessment tools to evaluate essential aspects of stroke recovery such as participation10 have also raised concern about the quality of care that some OTs are providing. These studies suggest that the research literature is not the main source of information that OTs rely on in clinical decision-making.

Factors Influencing Engagement in EBP

Facilitating the process of EBP among healthcare providers requires a change in practice approach among frontline clinicians, managers and administrators. Changing behaviour is challenging. Eighteen psychological theorists, 16 health services researchers and 30 health psychologists collaborated to simplify and synthesize a plethora of behaviour change theories and created the Theoretical Domains Framework.23 The purpose of the Theoretical Domains Framework is to inform interventions to improve implementation strategies and facilitate behaviour change at the individual level. Table 1 presents the definitions and associated constructs for each of the 14 theoretical domains in the refined framework.24
Table 1. Theoretical Domains Framework, Domain Definition and Constructs

<table>
<thead>
<tr>
<th>Domain</th>
<th>Definition</th>
<th>Constructs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Knowledge</td>
<td>An awareness of the existence of something</td>
<td>Knowledge</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Procedural knowledge</td>
</tr>
<tr>
<td>2. Skills</td>
<td>An ability or proficiency acquired through practice</td>
<td>Competence</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ability</td>
</tr>
<tr>
<td>3. Social/Professional</td>
<td>A coherent set of behaviours and displayed personal qualities of an</td>
<td>Professional role</td>
</tr>
<tr>
<td>Role and Identity</td>
<td>individual in a social or work setting</td>
<td>Identify</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Leadership</td>
</tr>
<tr>
<td>4. Beliefs about Capabilities</td>
<td>Acceptance of the truth, reality, or validity about an ability, talent, or</td>
<td>Self-efficacy</td>
</tr>
<tr>
<td></td>
<td>facility that a person can put to constructive use</td>
<td>Perceived competence</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Beliefs</td>
</tr>
<tr>
<td>5. Optimism</td>
<td>The confidence that desired goals will be attained</td>
<td>Optimism</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pessimism</td>
</tr>
<tr>
<td>6. Beliefs about Consequences</td>
<td>Acceptance of the truth, reality, or validity about outcomes of a behaviour</td>
<td>Beliefs</td>
</tr>
<tr>
<td></td>
<td>in a given situation</td>
<td>Outcome expectancies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consequences</td>
</tr>
<tr>
<td>7. Reinforcement</td>
<td>Increasing the probability of a response by arranging a dependent</td>
<td>Rewards</td>
</tr>
<tr>
<td></td>
<td>relationship, or contingency, between the response and a given stimuli</td>
<td>Incentives</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consequences</td>
</tr>
<tr>
<td>8. Intentions</td>
<td>A conscious decision to perform a behaviour</td>
<td>Transtheoretical model</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and stages of change</td>
</tr>
<tr>
<td>9. Goals</td>
<td>Mental representations of outcomes or end stages that an individual wants</td>
<td>Goal</td>
</tr>
<tr>
<td></td>
<td>to achieve</td>
<td>Action planning</td>
</tr>
<tr>
<td>10. Memory, Attention and</td>
<td>The ability to retain information, focus on aspects of the environment</td>
<td>Memory</td>
</tr>
<tr>
<td>Decisions Processes</td>
<td>and chose between 2 or more alternatives</td>
<td>Attention</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decision-making</td>
</tr>
<tr>
<td>11. Environmental Context and</td>
<td>Any circumstance of a person’s situation that discourages or encourages</td>
<td>Resources</td>
</tr>
<tr>
<td>Resources</td>
<td>the development of skills, abilities and behaviour</td>
<td>Organizational culture</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Barriers and facilitators</td>
</tr>
<tr>
<td>12. Social Influences</td>
<td>Those interpersonal processes that can cause individuals to change their</td>
<td>Social/Group norms</td>
</tr>
<tr>
<td></td>
<td>thoughts, feelings or behaviours</td>
<td>Social support</td>
</tr>
<tr>
<td>13. Emotion</td>
<td>A reaction pattern, involving experiential, behavioural, and physiological</td>
<td>Fear</td>
</tr>
<tr>
<td></td>
<td>elements by which a person attempts to deal with an event</td>
<td>Anxiety</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stress</td>
</tr>
<tr>
<td>14. Behaviour Regulation</td>
<td>Anything aimed at managing or changing actions</td>
<td>Self-monitoring</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Action planning</td>
</tr>
</tbody>
</table>
The majority of the domains captured in this framework are characteristics of the individual practitioner except for the *reinforcement, environmental context and resources, social influences* domains which can be considered characteristics of the environment or organization. Commonly reported barriers to EBP cited in the occupational therapy literature fall into the following domains: environmental context and resources, skills and knowledge, belief about consequences, memory and attention, motivation, intension and goals, and belief about capabilities domains. Self-efficacy is a particularly important individual level factor that requires specific attention as it is considered to be modifiable through graduate and post-graduate education.

Self-efficacy has been included as a relevant domain in EBP education. The evidence-based practice confidence (EPIC) scale has been recognized as one of the tools that can be used to evaluate self-efficacy for EBP, a category of educational assessment, within the Classification Rubric for EBP Assessment Tools in Education (CREATE) framework. The CREATE framework was proposed by the delegates of the 5th International Conference of Evidence-based Health Care Teachers and Developers held in Sicily in October 2009. The CREATE is a framework for categorizing EBP assessment tools. Using this framework, an EBP assessment tool can be classified according to what educational assessment category and step of EBP it represents. The categories of education assessment include: 1) reaction to the educational experience, 2) attitudes, 3) self-efficacy, 4) knowledge, 5) skills, 6) behaviour, and 7) benefits to patients. This framework is useful as it assists in the classification of new and existing tools, enables researchers to focus the intent of their assessment tool and generates a common language in the evaluation of EBP learning. This study highlights that the EPIC scale represents all five EBP steps (e.g. ask, search, appraise, integrate and evaluate). Using high quality measurement tools with established validity and reliability is essential for the accurate evaluation of EBP.

**Overview of Self-efficacy Theory**

Self-efficacy theory was developed by Albert Bandura, a Canadian-born psychologist. Bandura’s self-efficacy theory has become increasingly popular as a framework for understanding, modifying and predicting health behaviours.
Self-efficacy theory is based in Social Cognitive Theory and is comprised of two components that are postulated to influence behaviour: 1) self-efficacy beliefs and 2) outcome expectancies.\textsuperscript{22}

Self-efficacy beliefs refer to the perceptions of one’s capabilities to coordinate and execute a specific activity.\textsuperscript{22} Self-efficacy is believed to be domain-specific; that is, it relates to a specific behavior in a certain context and cannot be generalized to other behaviors or other situations.\textsuperscript{22} Furthermore, self-efficacy is not a measure of the skills that an individual has gained, but a belief about what that individual can do with whatever skill they possess. Outcome expectations is a person’s judgment that a certain behaviour will produce a certain resulting outcome.\textsuperscript{22} Outcome expectation is therefore a belief in the consequence of a specific behaviour.\textsuperscript{22} Self-efficacy, on the other hand, is a belief about capacity to perform a behaviour.\textsuperscript{22} The relationship between self-efficacy beliefs and outcome expectancies is depicted in Figure 1.

![Diagram of Bandura’s Self-efficacy Theory](image)

**Figure 1:** Components of Bandura’s Self-efficacy Theory\textsuperscript{22}

Self-efficacy beliefs are postulated to influence a person’s motivation, thought, affect and decision to engage in or avoid particular activities or settings.\textsuperscript{22} Once the task is initiated, strong perceived self-efficacy can influence coping and determine how much effort an individual will put forward into a challenging task.\textsuperscript{45} Although outcome expectations are important, they do not
solely drive performance if the component capabilities are lacking.\textsuperscript{22} Given the appropriate skills and motivation, self-efficacy beliefs are considered to be a major determinant of people’s choice of activities, how much effort they will expend and how long they will sustain effort in dealing with challenging tasks.\textsuperscript{45} A positive relationship between self-efficacy and behavior change has been consistently demonstrated in clinical populations\textsuperscript{47-50} and healthcare providers.\textsuperscript{51,52} Thus, self-efficacy theory provides a conceptual framework for understanding, modifying and predicting healthcare providers’ decisions to engage in and implement EBP.

**Sources of Self-efficacy Information**

Self-efficacy is considered to be a modifiable variable that can be influenced through four primary sources: 1) performance accomplishments, 2) vicarious experience, 3) verbal persuasion, and 4) emotional arousal.\textsuperscript{45}

*Performance accomplishments* refer to an individual’s performance of the particular behaviour as an indicator of the ability to do that task.\textsuperscript{45} When people experience success in the completion of a specific task, they should feel more confident in their ability. Repeated failures undermine self-efficacy, especially if failures occur in the early stages of task development and before a sense of efficacy is firmly ascertained.\textsuperscript{45} For example, when clinicians successfully conduct an effective literature search and obtain relevant literature that assists them in making evidence-based clinical decisions, they would be expected to complete this task more readily in future clinical encounters. However, if a clinician does not have adequate online searching skills and routinely experiences difficulty and frustration with conducting a literature search and locates literature with limited relevance to his/her patient, he/she may turn to other, less credible, sources of information in future clinical situations.

*Vicarious experience* refers to observing others successfully complete activities without adverse consequences. This may increase their belief that they too can attain the same level of success.\textsuperscript{45} Vicarious experience may be a weaker source of self-efficacy because it relies on processes of comparison rather than the direct experience of performing the behaviour.\textsuperscript{45} In addition, the benefit of vicarious experience on self-efficacy for a specific task is strongly related to the role model’s attitude, motivation and level of similarity with the observer.\textsuperscript{22}
Verbal persuasion refers to giving instructions and advice to try to convince people that they have the capabilities to achieve task mastery. For example, people who are persuaded verbally that they possess the capabilities to search for, critically appraise and integrate research evidence into practice are likely to apply greater effort and sustain it than if they experience self-doubt and dwell on personal deficiencies when complications occur. The effect of verbal feedback on self-efficacy is enhanced if the person providing feedback is viewed as being skilled, knowledgeable and credible about the specific activity.

Emotional arousal refers to the physiological and affective states that can affect a person’s estimation of the capability to perform a specific task. Stressful situations generate emotions that may negatively influence an individual’s perceived confidence for a specific task. For example, a healthcare providers’ ability may be debilitated when feelings of anxiousness and ineptitude are conjured up about having to critically appraise the research evidence and determine the relevance to specific clinical situations. Individuals are more likely to expect success when they are feeling emotionally and physiologically stable than if they are tense and overwhelmed by feelings of anxiety and agitation.

Therefore, according to this theory, individual beliefs about personal capabilities predict behaviour. Thus, by increasing OTs’ self-efficacy to acquire, appraise and apply the research literature, they are expected to undertake the steps of EBP more frequently in clinical practice.

The lack of self-efficacy in interpreting, synthesizing and applying research findings has been reported as a key barrier to implementing EBP across counties. Self-efficacy, a component of the beliefs about capabilities domain, is a key theoretical construct that should be considered when aiming to improve the implementation of EBP among healthcare professionals. Survey findings from Australia, the United States and the United Kingdom indicate that OTs lack self-efficacy to implement the steps of EBP. For example, the proportion of OTs reporting being quite, very or extremely confident in determining study design (37.9%), evaluating the validity of a study (37.6%) and using the Cochrane Library’s electronic databases (15.7%) was low in a survey of 649 Australian OTs. This study is limited, however, as the reliability of the adapted instrument utilized to measure confidence with specific EBP steps was not evaluated. The questionnaire, however, was pilot tested among 5 OTs to increase content
validity, acceptability and clarify. Furthermore, in a study evaluating the effects of a continuing education intervention on capacity to implement EBP, less than one quarter (17.5%) of the 114 Australian OT participants felt confident with their ability to critically appraise the research evidence and only 33.3% of respondents felt confident that they could generate a clinical question at baseline.¹⁷ The measurement tool used in this study has adequate reliability and validity for measuring both EBP knowledge and skills, however, the questions pertaining to confidence for EBP specific steps do not reflect the breadth of EBP.

Similarly, in an American study, the percentage of OTs surveyed who agreed or strongly agreed they could confidently use the Internet as a tool to search for research information, use electronic databases to search for research information, and critically appraising the quality of search studies was 45%, 20%, 33%, respectively.¹⁶ No evidence of the questionnaire’s reliability or validity was reported in this study. Insufficient perceived confidence for EBP related activities has also been reported by researchers in the United Kingdom exploring perceived barriers to EBP by health professionals working within the field of stroke rehabilitation.¹³ Among 26 OTs surveyed, 42% reported feeling confident in their ability to read and understand the stroke research literature, 58% of the respondents felt competent in carrying out a literature search on stroke-related topics, and 77% reported needing further training in critical appraisal.¹³ Although the questionnaire used in this study was created following focus groups to improve validity, no evidence of the questionnaire reliability was reported. Furthermore, study findings from a United Kingdom survey suggest that OTs lack confidence in EBP and reaffirm that commitments from both individual clinicians and the workplace are required to incorporate EBP into practice.²¹ No information was provided about the survey’s reliability or validity.

Although these findings suggest that self-efficacy beliefs are informative, a comprehensive evaluation in self-efficacy for EBP has not been undertaken in the profession of occupational therapy. Further investigation of EBP self-efficacy among OTs may provide educators and researchers with a basis for understanding the impact of EBP self-efficacy on EBP and for designing strategies to enhance self-efficacy for EBP among this group of professionals.
Factors Associated with Self-Efficacy

Self-efficacy is associated with a number of variables, including knowledge and skill, behaviour, and education and training experiences that relate to the conceptual framework of self-efficacy theory.

Knowledge and Skill

According to Bandura’s self-efficacy theory, a positive association is expected between self-efficacy and ability or skill for a related task. In clinical populations, for example, significant correlations between falls self-efficacy and balance, motor function, walking ability have been observed in patients undergoing stroke rehabilitation. Similarly, balance self-efficacy positively correlates with walking capacity and basic activities of daily living function among people with stroke (ρ=0.43-0.49). Furthermore, in people undergoing cardiac rehabilitation, self-efficacy of activity was positively related to maximum exercise tolerance sustained, maximum heart rate, exercise time, percentage of maximum predicted heart rate (ρ=0.39-0.66, p≤ 0.5). The correlation between EBP self-efficacy and EBP skills, however, has not been explored in the occupational therapy literature.

Behaviour

Evidence of the ability of self-efficacy to predict behaviour has been consistently demonstrated in clinical and healthcare provider populations. For example, among individuals undergoing stroke rehabilitation, ratings of falls self-efficacy more strongly predicted performance of activities of daily living post-stroke than measures of balance. Similarly, self-efficacy to maintain function and control symptoms predicted physical function, social function and family function in patients with coronary artery disease.

In healthcare professionals, self-efficacy to achieve results using lipid-lowering drugs was positively correlated with prescribing behavior among primary care physicians. In addition, self-efficacy, and not just academic performance, was found to be a significant predictor of clinical performance among student physician assistants. In another study, physical therapists who rated their EBP self-efficacy higher on the EPIC scale were found to search, read and use the research literature in clinical decision-making more frequently in a typical month compared
to those with low EBP self-efficacy ratings. Finally, a positive correlation was observed between self-efficacy in situation awareness and environment management and their overall performance of crisis resource management skills (ρ=0.52, p=0.004; ρ=0.44, p=0.076, respectively). This study supports the assertion that self-efficacy is related to successful performance of the associated skills. Therefore, further evaluating the predictive ability of perceived EBP self-efficacy for EBP behaviours among OTs is substantiated by the numerous studies in clinical populations and among healthcare providers.

*Education and Training Experiences*

Performance accomplishment is considered the most influential source of efficacy information as it is based on actual experiences of achievement and mastery. Thus, one could hypothesize that clinicians who have had opportunities to successfully execute the steps of EBP following education interventions may feel more confident in their abilities to engage in EBP activities. Many researchers have explored this association in the context of EBP and have reported positive associations. For example, a study involving a mailed survey of 270 Canadian physical therapists revealed that participants who reported academic preparation in the principles of EBP were almost 6 times more likely than those who did not have this education to score higher than 65% on the EBP self-efficacy scale (odds ratio=5.8, 95% CI 3.4-9.9). Furthermore, results of an online survey of 182 allied health staff, including OTs, nutritionists and dieticians, physical therapists, psychologists, audiologists, speech and language pathologists and social workers in Australia, suggested that EBP self-efficacy was higher in allied health professionals who had participated in education in literature searching and/or research design and analysis than in health professionals reporting no training in these areas. Another group of Australian researchers revealed that confidence for generating a clinical question, using the Internet and critically appraising the research evidence improved significantly following a multifaceted EBP educational program. Thus, there is preliminary evidence that EBP education is positively associated with EBP self-efficacy.

Researchers have also identified a positive association between highest degree obtained and self-efficacy for EBP. For example, higher confidence for specific EBP skills has been reported
among Australian, American, and Canadian health care professionals with higher qualifications than those with lower qualifications.

Studies suggest that participating in research projects is associated with greater use of research evidence in practice among OTs. For example, a comparative study of OTs from Australia, the United Kingdom and Taiwan suggest that Taiwanese participants were found to have significantly higher knowledge and practices of “administering research implementation,” of “conducting and communicating research” and “establishing current best practice” compared to OTs in Australia and the United Kingdom. In addition, OTs in clinical practice have reported that participating in research teams re-emphasizes the values of EBP, the importance of selecting being critical in selecting assessments and interventions, and highlighted the importance of listening to their patient’s perspectives. Furthermore, results of a scoping study suggest that creating opportunities for OTs to participate in research projects may be a key method to facilitate EBP. Many skills required for successful implementation of EBP are essential in participating in clinical research. Therefore, one could also hypothesize that OTs participating in research would likely have high EBP self-efficacy beliefs.

In summary, there is theoretical and empirical evidence to support the expected association between EBP skill and knowledge, participation in EBP behaviours, education in EBP, and participation in research with EBP self-efficacy.

**Evaluation of Self-efficacy to Implement EBP**

Given the impact of EBP self-efficacy on the implementation of EBP steps, educators leading continuing education training programs need accurate evaluation tools to capture change in EBP self-efficacy among individual learners to demonstrate the effectiveness of their program. However, researchers suggest there is a lack of validated and practical assessments tools to evaluate EBP learning. For example, a systematic review of available EBP teaching evaluation instruments revealed that of the 104 unique instruments critically appraised, only 10% were considered high quality instruments. None of these high quality instruments report measuring EBP self-efficacy.
The lack of high quality instruments for the evaluation of education targeting ability to implement EBP has also been reported in a more recent systematic review in the field of occupational therapy. Researchers have attempted to evaluate self-efficacy related to EBP steps for descriptive purposes or to evaluate effects of EBP education. However, these measures do not adequately cover the breadth of EBP or do not report on the measure’s validity or reliability. For example, researchers set out to evaluate changes in knowledge, skills, confidence, abilities and EBP behaviours following a 2-day EBP workshop combined with outreach support. The authors developed a questionnaire from existing instruments. The adapted questionnaire was pilot tested to improve content validity. The questionnaire contained 3 questions regarding confidence to participate in EBP (e.g. “I am confident that I can generate a clinical question”; I am confident about my general computer skills such as using the internet”; “I feel confident that I can critically appraise research evidence”). This questionnaire is limited, however, as it assesses confidence to implement a limited number of EBP steps.

In another study, researchers set out to evaluate OTs’ attitudes to EBP, their perception of implementation barriers or their educational needs. They adapted a previously developed questionnaire regarding the perceptions of general practitioners of EBP. This survey was pilot tested among five individuals and changes were made to increase the content validity, acceptability and clarity, however, no evidence of the questionnaire’s reliability was reported.

Finally, a study utilized a questionnaire to measure factors related to EBP practice, including perceived confidence for 3 specific EBP skills. This questionnaire did not reflect the breadth of EBP and lacked evidence of validity and reliability.

These studies outline the need for a reliable and valid tool to evaluate EBP self-efficacy as the available tools are lacking thorough inclusion of items addressing the major domains of EBP and have limited research supporting their reliability and validity.

**Evidence-based Practice Confidence (EPIC) Scale**

Given the value of self-efficacy as a determinant of behavior change and an outcome of educational interventions targeting EBP, Salbach and Jaglal developed the 11-item EPIC scale. The purpose of the EPIC scale is to evaluate confidence in the ability to complete specific steps...
of EBP and evaluate the effects of interventions on improving these beliefs among healthcare professionals. The EPIC scale is a self-report questionnaire. Each item describes a step in the process of EBP. To complete the scale, the individual rates his/her level of confidence to perform each step on a scale that ranges from 0% (no confidence) to 100% (completely confident). The EPIC scale was based on Bandura’s\textsuperscript{45} guide to developing self-efficacy scales (e.g. 100-point scale ranging in 10-unit intervals from 0% confident to 100% confidence). Scores on each item are averaged to obtain a summary score that ranges from 0 to 100 percentage points (%points).\textsuperscript{25} The EPIC scale is considered a valuable measure as it was created using established guidelines.\textsuperscript{63} Items were generated based on recognized models of EBP.\textsuperscript{26,64-69} Items in the EPIC scale pertain to identifying a gap in one’s knowledge, formulating a clinical question, conducting a literature search, critically appraising the evidence, interpreting statistical tests, determining the relevance of the evidence, asking patients about their needs, values and treatment preferences, integrating the research evidence into practice, and evaluating outcomes. The EPIC scale has an advantage over other questionnaires that purport measuring self-efficacy for EBP as it incorporates steps related to evaluating patient’s values and preferences. The EPIC scale is based on a reflective model, which means that all items on the EPIC scale reflect the same underlying construct and can be considered interchangeable.\textsuperscript{70} As a result, calculating the internal consistency of the EPIC scale is relevant.\textsuperscript{63}

The face and content validity of the EPIC scale was established among 14 healthcare professionals with expert knowledge in EBP, including 4 physical therapists, 2 OTs, 2 physicians, 2 nurses, 3 speech and language pathologists and 1 epidemiologist.\textsuperscript{25} Feedback regarding face and content validity the EPIC’s scale’s was obtained via emailed questionnaires. Comprehensibility of the EPIC scale was then explored by completing telephone-based cognitive interviews with 10 healthcare professionals in clinical practice (e.g. 2 physicians, 3 nurses, 2 physical therapists, 1 OT, and 2 speech and language pathologists). In addition, the EPIC scale has excellent test-retest reliability (intraclass correlation coefficient (ICC)=0.89, 95% confidence interval (CI)=0.85-0.91, n=187) and internal consistency (Cronbach’s $\alpha$=0.89, 95% CI 0.86 to 0.91, n=275) among physical therapists. Furthermore, the EPIC scale has acceptable construct validity as indicated by the positive association observed between highest ratings for EBP self-efficacy and higher levels of educations and frequency of searching, reading and using research literature in clinical decision-making among physical therapists.\textsuperscript{30} The estimated minimal
detectable change at the 90% confidence level (MDC_{90}) of the EPIC scale is 5.1 %points among physical therapists.\textsuperscript{71} Thus, when the EPIC scale is used to monitor the effects of an intervention, it is of interest to observe change that is at least 5 %points to be sure that the change is ‘true’ and not due to measurement error.

Since its development, the EPIC scale has been adapted to evaluate the effects of an online EBP module on increasing EBP knowledge and skills among postgraduate medical students.\textsuperscript{72} The measurement properties of the EPIC scale, however, are unknown among OTs and need to be explored prior to using among OTs.

**Assessing the Methodological Quality of Studies on Measurement Properties**

The Consensus-based Standards for the selection of health Measurement Instruments (COSMIN) checklist provides quality criteria for designing, reporting or evaluating the reporting of studies investigating measurement properties of assessment tools and was used to guide this work.\textsuperscript{73} The checklist criteria and scoring system were developed based on the consensus of an international group of measurement experts.\textsuperscript{73-75} The COSMIN checklist includes the following measurement properties: reliability, measurement error, internal consistency, content validity, construct validity (including structural validity, hypotheses testing, and cross-cultural validity), criterion validity, and responsiveness.\textsuperscript{75} In addition, an important characteristic to evaluate is floor and ceiling effects.\textsuperscript{75} The measurement properties of the EPIC scale that should be evaluated in OTs include test-retest reliability, measurement error, internal consistency, floor and ceiling effects, and construct validity. Given that OTs were included in the evaluation of the EPIC scale’s face and content validity,\textsuperscript{25} these psychometric properties do not require replication. Furthermore, as there is no gold standard measure of EBP self-efficacy, evaluation of criterion validity is not required.

Within the COSMIN framework, the domain of *reliability* reflects the degree to which a measurement tool is free from measurement error.\textsuperscript{74} More specifically, *reliability* is the extent to which scores for individuals who are believed to have not changed related to the construct of interest are the same for repeated testing under various conditions: for example over time (test-retest), by the same individuals (i.e. responders or raters) at different times (intrarater), by different raters on the same occasions (interrater) and using different sets of items from the same
measurement instrument (internal consistency). Reliability of a measurement is distinctly linked to the population in which the analysis was completed.\textsuperscript{63} In other words, reliability is not linked to a specific measurement tool, but is population dependent.\textsuperscript{63} The definition of reliability as it relates to the measurement property refers to the proportion of the total variance in the measurement which is attributed to “true” differences in the trait being measured.\textsuperscript{74} Measurement error is the systematic and random error of an individual’s score that is not due to ‘true’ differences in the construct of interest being measured.\textsuperscript{74} When the test-retest reliability of a measure is satisfactory, we can feel confident that the change in the construct of interest following an intervention is due to ‘true’ change and not measurement error. Internal consistency is defined as the interrelatedness among items in a measurement tool.\textsuperscript{74} This property is necessary to evaluate for scales following a reflective model, i.e., when all the items of a scale reflect the same underlying construct and can be considered interchangeable.\textsuperscript{63}

Validity is the degree to which a measurement tool measures the construct(s) it claims to measure.\textsuperscript{74} Known groups construct validity is evaluated when an instrument is expected to distinguish across different groups in a hypothesized, logical manner.\textsuperscript{76} The evaluation of construct validity requires the formation of hypotheses about a construct of interest and then examining the degree to which the measure being studied generates results that are consistent with the proposed hypotheses.\textsuperscript{77} The COSMIN guide specifies that hypotheses for the evaluation of construct validity should include the expected direction and magnitude of the correlation or mean difference.\textsuperscript{73} Furthermore, in order for a scale to detect change and be clinically useful, it must not demonstrate floor or ceiling effects.\textsuperscript{29} Investigators report that floor or ceiling effects are considered to be present if more than 15\% of respondents achieve the lowest or highest possible score, respectively.\textsuperscript{29} If floor or ceiling effects are present, a possible conclusion is that extreme scale items are missing in the lower or upper portions of the scale, suggesting the scale does not include an adequate range of items (i.e. content validity).\textsuperscript{29}

**Relevance to Occupational Therapy**

Researchers report that OTs encounter unique challenges related to EBP that are different from other healthcare professions.\textsuperscript{13,28,58} For example, research has demonstrated that OTs’ EBP self-efficacy was significantly lower than those of other healthcare professionals including nutrition
and dietetics, physical therapists, and psychology. Similar low levels of perceived confidence for EBP were reported in a study of perceived barriers to EBP among health professionals working in stroke rehabilitation in the United Kingdom. Study findings indicated that there are significant differences in OTs’ confidence in their ability to read and understand research literature compared to physical therapists and nurses. OTs were also found to be more in agreement with the statement “I get put off when I see statistics used in published research” than physical therapists. Furthermore, the sources of information that OTs solicit may also be different than other professions. For example, clinical experience, continuing education and colleagues/mentors are the most frequently used sources of knowledge underpinning clinical decision-making among OTs. Furthermore, researchers suggest that there is an insufficient amount of OT specific research. This lack of research relevant to occupational therapy practice is considered a barrier to adopting or implementing EBP among OTs. As a result, there is a need to utilize discipline specific tools that can capture the OT professions’ own EBP needs and concerns. Therefore, in conducting this study, we respond to a call by Glegg and Holst for researchers to provide sound and comprehensive EBP tools appropriate for use in the profession of occupational therapy. Furthermore, reliability is not a fixed property of a rating scale, but is population-dependent. Therefore, the psychometric properties of the EPIC scale should be examined among OTs prior to using its use in this population.

Finally, the relationship between EBP self-efficacy and EBP knowledge and skills has not been explored in the field of occupational therapy thus far. Exploring this relationship may contribute to the understanding of the implementation of EBP among OTs and support the EPIC scale’s construct validity.

**Research Purpose and Objectives**

The purpose of this study was to evaluate the psychometric properties of the EPIC scale among OTs. Specific objectives were to estimate test-retest reliability, measurement error, MDC, internal consistency, floor and ceiling effects, and known groups construct validity of the EPIC scale for this group of healthcare professionals. Hypotheses for the evaluation of construct validity were formulated a priori based on the conceptual framework for Self Efficacy Theory, empirical evidence of associations between self-efficacy beliefs and other variables in healthcare
professionals\textsuperscript{14,30,43,45,82} and the expectation of a difference in mean EPIC scores between known groups beyond the MDC\textsubscript{90} value of 5.1 \%points for the EPIC scale observed among physical therapists\textsuperscript{30,71} corresponding to a medium effect size. Specifically, we hypothesized that the mean self-efficacy rating on the EPIC scale would be:

1. 7 \%points higher in OTs with a masters or doctoral degree than in OTs with a diploma or bachelor degree
2. 7 \%points higher in OTs who reported learning the foundations of EBP as part of their academic preparation than those who did not receive education in EBP
3. fairly correlated (\(\rho=0.25-0.50, \ p<0.05\))\textsuperscript{83} with scores on the adapted fresno test of competence in evidence-based practice (AFT)\textsuperscript{78}
4. 7 \%points higher in OTs who more frequently conduct online literature searches, read or review research literature related to their clinical practice or use research literature in clinical decision making than those who perform these EBP activities less frequently
5. 7 \%points higher in OTs who report participating in research than those who do not participate in research
Chapter 3

Validation of the Evidence-based Practice Confidence (EPIC) Scale among Occupational Therapists

Clyde, J.C., Brooks, D., Cameron, J.I., & Salbach, N.M.

This manuscript will be submitted for consideration for publication in the

American Journal of Occupational Therapy
Abstract

Background. Self-efficacy is a key theoretical construct that should be considered when aiming to improve the implementation of evidence-based practice (EBP) among occupational therapists (OTs). Current available tools measuring self-efficacy to implement the steps of EBP in the field of occupational therapy contain a limited number of EBP steps without strong evidence of reliability or validity. Thus, there exists a need for a reliable and valid tool to evaluate EBP self-efficacy among OTs.

Objectives. To evaluate the reliability (test-retest, measurement error, minimum detectible change (MDC), and internal consistency), floor and ceiling effects and known groups construct validity of the evidence-based practice confidence (EPIC) scale among OTs. To evaluate construct validity, we tested hypotheses that level of education, education in EBP, EBP knowledge and skill, participation in EBP activities, and participation in research would be positively associated with self-efficacy rated on the EPIC scale.

Method. A repeated measures study involving a baseline and a follow-up mail survey was conducted. A random sample of 1077 registered OTs in Ontario, Canada was mailed the EPIC scale and a questionnaire to evaluate construct validity. A second copy of the EPIC scale was mailed on receipt of a completed baseline questionnaire to evaluate test-retest reliability.

Results. One hundred and twenty-six OTs completed the EPIC scale and construct validity questionnaire at baseline and 79 completed the EPIC scale at retest. Test-retest reliability (intracllass correlation coefficient (ICC)) was 0.92 (95% confidence interval (CI), 0.88-0.95, n=79). The MDC95 was calculated to be 4.6 %points. Internal consistency, estimated using Cronbach’s α, was 0.91 (95% CI 0.89-0.93, n=126). None of the participants obtained a total score of 0 or 100 %points on the EPIC scale. Participants with a master’s degree had higher ratings on the EPIC scale than those with a bachelor degree or diploma (U=1225, p<0.001). Therapists who reported previous academic training in EBP had higher ratings than those with no EBP training (mean difference=8.3 %points, 95% CI 2.2 to 13.9). Participants with high levels of EBP self-efficacy more frequently conducted online literature searches (U=1319, p=0.04), read or reviewed literature related to their clinical practice (mean difference=8.5 %points, 95% CI 1.8 to 15.3), and used professional literature and research findings in clinical decision-making (mean
difference: 7.6 %points, 95% CI 1.3 to 13.8), than participants with low self-efficacy ratings.
Scores on the EPIC scale and the adapted fresno test of competence in evidence-based practice (AFT) correlated positively (ρ=0.21, p=0.02). No association was found between EBP self-efficacy and participation in research (mean difference=-0.5 %points, 95% CI -6.1 to 5.0).

**Conclusion.** The EPIC scale has acceptable reliability and validity and is recommended for use among OTs for descriptive purposes, to monitor change in EBP self-efficacy over time and to evaluate the impact of continuing education on EBP self-efficacy.

**Key words:** evidence-based practice, self-efficacy, validity, reliability, validation studies, questionnaire, evaluation studies, occupational therapists
**Introduction**

Evidence-based practice (EBP) is an approach to clinical decision-making that has influenced healthcare service delivery. Evidence-based practice has been defined as the integration of the best available research evidence with clinical expertise and patient values and preferences. Occupational therapists (OTs) are expected to work within an EBP context to increase assessment and treatment efficiencies, effectiveness and ultimately patient outcomes. In addition, the translation of research evidence into clinical decision-making is a basic expectation of registered OTs and is embedded in the essential competencies required for practice in Canada, the United States and the United Kingdom.

Despite the available evidence and the emphasis on EBP, there is a delay in moving research findings into clinical practice among OTs. Major barriers to implementing research findings into practice include a lack of protected time to search for and incorporate research findings into decision-making, insufficient skill and knowledge to retrieve and critically appraise the research and a lack of self-efficacy to search, interpret and apply research evidence.

Perceived self-efficacy, a key concept in Bandura’s Social Cognitive Theory, refers to the perceptions in one’s capabilities to execute a specific activity. Perceived self-efficacy is believed to be domain-specific; that is, it relates to a specific behavior in a certain context and cannot be generalized to other behaviors or other situations. Self-efficacy beliefs are postulated to influence a person’s motivation, thought, affect and decision to engage in or avoid particular activities or settings. A positive relationship between self-efficacy and behavior change has been consistently demonstrated in clinical populations and healthcare providers.

Self-efficacy is a key theoretical construct that should be considered when aiming to improve the implementation of EBP among healthcare professionals. Perceived self-efficacy is positively associated with level of degree held, education in EBP, and the frequency at which physical therapists search, read and use professional literature in their clinical practice.

Self-efficacy is a modifiable variable that can be enhanced through four mechanisms. Explained in the context of EBP, these mechanisms include personally experiencing success.
when implementing the steps of EBP (performance accomplishment), observing colleagues experience success when implementing the steps of EBP (vicarious experience), receiving positive feedback (verbal persuasion), and feeling emotionally and physiologically stable when using EBP in clinical decision-making (emotional arousal). Therefore, according to this theory, if we can increase OTs’ self-efficacy to acquire, appraise and apply the research literature, they may undertake the steps of EBP more frequently in clinical practice.

The investigation of EBP self-efficacy among OTs is limited by a lack of validated assessment tools. A recent systematic review examined tools being used to evaluate OTs’ EBP knowledge and skills. Of the 15 measures identified, only 3 were considered adequate for the measurement of EBP knowledge and skills in occupational therapy. Several studies listed in this systematic review report measuring perceived confidence or skill to undertake the necessary activities associated with EBP, however, they have utilized questionnaires that contain a limited number of EBP steps without strong supporting evidence of reliability or validity.

Given the value of self-efficacy as a determinant of behavior change and outcome of behavioral interventions, Salbach and Jaglal developed the 11-item evidence-based practice confidence (EPIC) scale (Appendix A). The EPIC scale was developed to assess confidence in ability to perform specific steps of the EBP process among healthcare professionals. Although face and content validity were evaluated in multiple health professional groups, including OTs, the evaluation of reliability and construct validity has been limited to physical therapists.

Researchers have proposed that OTs encounter unique challenges related to EBP that are different from other healthcare professions and that there is a need to utilize discipline specific tools that can capture the OTs’ EBP needs and concerns. Furthermore, reliability is not a fixed property of a rating scale, but is population-dependent. Therefore, the EPIC scale’s psychometric properties need to be explored among OTs prior to using it to evaluate the effects of an intervention to improve EBP competence among this group of clinicians.

Thus, the purpose of this study was to evaluate the psychometric properties of the EPIC scale among OTs. Specific objectives included estimating test-retest reliability, measurement error, MDC, internal consistency, floor and ceiling effects, and known groups construct validity of the EPIC scale. Hypotheses for the evaluation of construct validity were formulated a priori based on
the conceptual framework for Self-Efficacy Theory, empirical evidence of associations between self-efficacy beliefs and other variables in healthcare professionals\textsuperscript{14,30,43,45,82} and the expectation of a difference in mean EPIC scores between known groups beyond the minimal detectible change at the 90\% confidence level (MDC\textsubscript{90}) value of 5.1 percentage points (\%points), corresponding to a medium effect size, for the EPIC scale observed among physical therapists.\textsuperscript{30,71} Specifically, we hypothesized that the mean self-efficacy rating on the EPIC scale would be:

1. 7 \%points higher in OTs with a masters or doctoral degree than in OTs with a diploma or bachelor degree
2. 7 \%points higher in OTs who reported learning the foundations of EBP as part of their academic preparation than those who did not receive education in EBP
3. fairly correlated ($\rho=0.25-0.50$, $p<0.05$)\textsuperscript{83} with scores on adapted fresno test of competence in evidence-based practice (AFT)\textsuperscript{78} (Appendix B)
4. 7 \%points higher in OTs who more frequently conduct online literature searches, read or review research literature related to their clinical practice or use research literature in clinical decision making than those who perform these EBP activities less frequently
5. 7 \%points higher in OTs who report participating in research than those who do not participate in research

Method

Overview of Study Design

A repeated measures study involving a baseline and 2-week follow-up mail survey of randomly selected registered OTs in Ontario, Canada was conducted. A package including an information letter (Appendix C) explaining the study aim and assuring confidentiality, an eligibility form (Appendix D) the EPIC scale, a brief questionnaire used to evaluate construct validity (Appendix E), and the AFT was mailed to OTs at baseline. To evaluate test-retest reliability, an information letter (Appendix F) a second copy of the EPIC scale and a 2-item questionnaire collecting data on participation in educational activities during the retest (Appendix G) period were mailed to respondents upon receiving a completed baseline package. The University of Toronto office of research ethics approved the research protocol (Appendix H).
Participants and Sampling

Occupational therapists were considered eligible if they were registered with the provincial regulatory body which was the College of Occupational Therapists of Ontario (COTO). Potential participants were randomly sampled from an electronic mailing list provided by COTO. Participant responses were excluded from the reliability analysis if they described taking part in a continuing education event that involved teaching the steps of EBP during the retest period. When evaluating test-retest reliability, it is assumed that the construct of interest is not likely to have changed between the two test administrations. Participation in an EBP continuing education event during the retest period may increase an individual’s EBP self-efficacy, and in turn, artificially reduce the magnitude of the reliability estimate.

Recruitment

A modified Dillman approach was implemented to optimize the response rate. A sample of OTs was randomly selected and mailed an information letter inviting them to participate in the study, a single copy of the EPIC scale, and questionnaires, including the AFT required for the evaluation of construct validity, and a business–reply envelope. The AFT is a test developed to assess knowledge and skills in the major domains of EBP. The first response item on the construct validity questionnaire asked the recipients to indicate whether they were an OT registered with their provincial regulatory body. If they responded “no” they were instructed to leave the remainder of the questionnaires blank and return them in the business-reply envelope provided so they could be removed from the mailing list. If the recipient responded “yes”, the information letter contained instructions to complete and date the questionnaire, EPIC scale, and AFT, and return the documents in the business-reply envelope provided. Eligible recipients who did not want to take part in the study were asked to return the blank package to inform the researchers of their refusal. A reminder letter (Appendix I) and the same baseline package were mailed to non-responders 3.5 weeks after the initial mailing to optimize the response rate. An option to receive a one-page report of the study findings was offered to recipients as an incentive to complete the study questionnaires.

Within 2 days of receiving a completed baseline package, a second copy of the EPIC scale and a 2-item questionnaire was mailed for the evaluation of test re-test reliability. The questionnaire
items asked participants to identify and describe participation in any educational activity targeted at improving their ability to implement EBP since completing the first EPIC scale. Consent was implied for participants mailing back a completed questionnaire.

Data Collection

EPIC Scale. The EPIC scale\textsuperscript{25,30} is a self-report questionnaire where each item on the scale ranges from 0\% (no confidence) to 100\% (completely confident) and scores on each item are averaged to obtain a summary score that ranges from 0 to 100 percentage points (%points).\textsuperscript{25,30} The EPIC scale’s face and content validity were established through expert review and cognitive interviewing techniques among healthcare professionals, including physical therapists, OTs, physicians, nurses, speech and language pathologists and an epidemiologist.\textsuperscript{25} In addition, research findings suggest the EPIC scale has excellent test-retest reliability (intraclass correlation coefficient (ICC)=0.89, 95\% confidence interval (CI)=0.85-0.91, n=187) and internal consistency (Cronbach’s $\alpha$=0.89, 95\% CI 0.86 to 0.91, n=275) and acceptable construct validity among physical therapists as indicated by the positive association observed between highest ratings for EBP self-efficacy and higher levels of educations and frequency of searching, reading and using research literature in clinical decision making.\textsuperscript{30} The estimated MDC\textsubscript{90} of the EPIC scale is 5.1 %points among physical therapists.\textsuperscript{71}

AFT. The AFT\textsuperscript{78} (version 1), a 7-item self-report instrument, was used to assess knowledge and skill to implement EBP. The AFT is an adaptation of the Fresno Test of Competence in Evidence-Based Medicine,\textsuperscript{87} which was developed to assess knowledge and skills in the major domains of EBP. Items on the AFT are scored by comparing participant responses to a grading rubric. Item-level scores are then summed to obtain a total score that can range from 0 to 156 points. The inter-rater reliability (Version 1: ICC=0.96 95\%CI: 0.83-0.99), internal consistency (Cronbach’s $\alpha$=0.74) have been reported to be acceptable among OTs.\textsuperscript{78} As recommended by AFT developers,\textsuperscript{78} participants scoring below the 50\% “pass” mark of 78/156 were classified as low scorers and participants scoring 78/156 or higher were classified as high scorers. As the purpose of the AFT is to gain an understanding of an individual’s EBP skills and knowledge, written instructions were provided to not use external resources (e.g. Internet sites, books etc.) when completing the AFT. Participants were asked to initial the test to confirm that they had
completed the AFT without accessing external resources. One author (JC) scored the AFT following training with senior author NMS. During training, both authors independently scored 4 tests and discussed findings to reach a consensus.

*Construct Validity Questionnaire.* The purpose of the construct validity questionnaire was to measure variables for construct validity testing, including level of degree held, education in EBP, participation in EBP activities, and participation in research. The construct validity questionnaire administered at baseline contained items pre-tested for face and content validity.\textsuperscript{30,43,82} Level of degree held was determined by asking participants to identify their highest degree obtained. An item was added to the construct validity questionnaire to explore the relationship between EBP self-efficacy and receiving the foundations for EBP as part of the participant’s academic preparation. Response options for this question included: strongly disagree, disagree, neutral, agree and strongly agree. Performance of EBP activities was assessed by asking participants to report how often in a typical month they: 1) perform literature searches using Medline or other databases, 2) read or review the research evidence related to their clinical practice, and 3) utilize research findings in their day to day clinical decision making. Response options were: ≤1, 2-5, 6-10, 11-15 and ≥16 times. Participation in research was identified if respondents reported being involved in research either as a recruiter of study participants, assessor of study participants, provider of treatment, or investigator. Additional questions captured data on socio-demographic and practice characteristics including: age, sex, years of clinical experience, hours worked per week, time spent in direct patient care, area of practice, practice setting type and location (rural, urban or suburban), supervision of OT students, participation in OT student education and academic affiliation of their work institution. This information was collected to determine the generalizability of the sample obtained.

A 2-item questionnaire was sent with the retest package. The first item asked respondents to report if they had participated in an educational activity targeted at improving ability to implement EBP since completing the first EPIC scale with response options yes or no. If participants responded “yes”, they completed the second item asked them to identify the date, type, duration and details of the education event.
Analysis

Data were analyzed using the SPSS version 20.0. Only baseline data were used to evaluate construct validity and internal consistency. A type I error level of 0.05 determined statistical significance in hypothesis testing.

Test-retest Reliability. After verifying normality of the data, test retest reliability was estimated using the ICC\(^{63}\) (ICC: type 2:1) and the associated 95\% CI. The ICC is interpreted as the proportion of the total variance in scores that can be attributed to ‘true’ differences among the participants.\(^{63}\) An ICC of 1 indicates perfect reliability, ≥0.75 reflects excellent reliability, 0.4 to 0.74 reflects adequate reliability, and <0.4 reflects poor reliability.\(^{89}\) When interpreting a measure clinically (e.g. at the individual level), an ICC of at least 0.90 and a lower 95\% CI limit of at least 0.85 are recommended.\(^{90}\)

Measurement Error. The ICC value was used in the calculation of the standard error of measurement (SEM) according to the formula: \(1 \text{ SEM} = \sigma \sqrt{1 - R}\), where \(\sigma\) is the standard deviation of change scores, and \(R\) is the reliability coefficient (i.e. the ICC).\(^{91}\) The interpretation of measurement error is that, with repeated scoring, the true change in an individual score on the EPIC scale would lie within ±1 SEM of the observed change score 68\% of the time. The SEM was then used to compute the MDC at the 90\% and 95\% confidence levels in the following manner: \(\text{MDC}_{95} = 1.96 \times (\sqrt{2} \times \text{SEM})\) and \(\text{MDC}_{90} = 1.65 \times (\sqrt{2} \times \text{SEM})\).\(^{91}\) When an individual change score exceeds the MDC, there is reasonable certainty (at the specified confidence level) that it reflects true change, not error or noise.\(^{77}\)

Internal Consistency. Baseline data were used to estimate the EPIC scale’s internal consistency using Cronbach’s \(\alpha\)\(^{88}\) and the associated 95\% CI was calculated using equations outlined by measurement experts.\(^{63}\) The alpha value can range from 0 to 1 and is interpreted as excellent (≥0.8), moderate (>0.70 to <0.8) or inadequate (≤0.7).\(^{89}\)

Floor and Ceiling Effects. Floor and ceiling effects were calculated as the proportion of participants scoring the minimum (0 %points) and maximum score (100 %points), respectively, for each EPIC scale item and for the total EPIC score. A scale is considered to exhibit a floor or
ceiling effect if more than 15% of respondents completing a scale achieve the lowest or highest possible score, respectively.29,92,93

Known Groups Construct Validity. Response frequencies from the baseline survey questionnaire were determined and displayed in tabular and graphic formats. Response scales for each variable, including level of degree held, education in EBP, participation in EBP activities, and participation in research required for testing construct validity hypotheses were recategorized as binary variables to enable 2-group comparisons. The sample size per category group was verified to ensure sufficient numbers for analysis. For the construct validity hypothesis related to highest degree held, 2 groups were created that included all certificate/diploma and bachelor degrees and all advanced degrees (entry level masters, applied masters and doctoral).

Education in EBP was measured using an item with a 5-point Likert response scale. For statements with a positive response set, the “strongly agree” and “agree” categories were combined and the “neutral”, “disagree” and “strongly disagree” were also combined so that responses fell into 1 of 2 categories: “agree” or “neutral/disagree”.

Participation in EBP activities was measured by items categorized by the number of times databases were searched, by the number of times journal articles were read and by the number of times the professional literature was used in clinical decision-making. The lower category was distinguished from the higher category based on participant response distribution within the categories and based on our belief that the lowest level of access represented poor attention and use of research evidence and EBP.

Research participation was measured using an item with the following response options: recruiter of study participants, evaluation of study participants, provider of treatment for study participants, investigator in clinical research. Positive responses in these categories were combined to create the “yes” category. The frequency of which this question was left blank created the “no” category.

After item categories were collapsed, the independent samples t-test or, if data were not normally distributed, the Mann-Whitney U test was used to test hypothesized relationships between EBP
self-efficacy and binary variables including: highest degree obtained, receiving the foundations of EBP in academic preparation, participation in EBP activities, and participation in research.

The Pearson correlation was used to test the hypothesis that an association exists between baseline ratings on the EPIC scale and the AFT. The r-value can range from 0 to 1 and was interpreted as very good (≥0.75), moderate (0.50-0.75), fair (0.25-0.5) and little or no relationship (0-0.25).83

Sample Size

Construct validity. The sample size required for each analysis was estimated and the maximum value used to guide sampling. The sample size required to detect a correlation magnitude of 0.3 for estimating the relationship between EPIC and AFT scores, at a two-sided Type I error level of 0.05 and a Type II error level of 0.20, is 85 participants.94 The sample size required to test known groups construct validity hypotheses is based on a t-test. The use of the t-test is appropriate as hypotheses involve a comparison of mean EPIC scores between two groups that are expected to differ in a predicted way. To detect a mean difference of 7 %points between two known groups, given an estimated standard deviation (SD) of 14 observed in a study of physical therapists30 (i.e., a medium effect size: 7/14=0.583), and a Type II error level of 0.20, a sample size of 126 is required.95 Given an expected response rate of 26%,7 it would be necessary to mail a questionnaire to at least 485 OTs to obtain data on a baseline sample of 126 participants to evaluate construct validity.

Test-retest reliability. A sample size of 86 participants is required to obtain an expected ICC point estimate 0.89 observed in physical therapists30 with a width of the lower 95% CI of 0.05, and two measurements per participant.63 In the mail survey to evaluate test-retest reliability of the EPIC scale in physical therapists,30 a retest response rate of 68% was observed.30 Thus, 126 OTs at baseline would be required to obtain 86 participants at retest. Given the expected response rate of 26% at baseline7 it would be necessary to mail questionnaires to at least 486 OTs.
Results

An initial survey of 538 OTs was conducted in September 2011. Due to a low response rate, however, a second mailing was performed in January 2012. Figure 1 illustrates the individual and pooled sampling results from Fall 2011 and Winter 2012 mailings. Questionnaires were mailed to a total of 1,077 registered OTs. Of the 294 (27%) individuals who returned a questionnaire, 274 (93%) were eligible to participate in the study. Of the 274 eligible respondents, 147 (54%) refused to participate and 127 (46%) completed a questionnaire. Of the 127 individuals who completed a baseline questionnaire, 84 completed the retest questionnaire. The retest questionnaire was completed a median of 24 days later, interquartile range (IQR)=19. Of the 84 individuals who completed the retest questionnaire, 3 (4%) reported participating in a continuing education event that involved teaching the steps of EBP and were subsequently removed from the reliability analysis. In addition, data were missing for 1 participant at baseline and 1 participant at retest. Thus, data from 126 participants at baseline were used to estimate validity, internal consistency, and floor and ceiling effects and data from 79 participants with complete data at baseline and at retest were analyzed to estimate test-retest reliability and the MDC. The median age of the 126 participants in the baseline sample was 40 years, IQR=15 and 92.9% were female. Table 2 represents participant characteristics for both the validity sample (n=126) and the reliability sample (n=79).
Figure 2. Sampling Results for Mail Survey. Numbers are presented for the pooled sample and the individual Fall (F) and Winter (W) mailings. Abbreviations: CE, Continuing Education.
Table 2: Characteristics of Study Participants and their Practice

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Validity Sample (n=126)</th>
<th>Reliability Sample (n=79)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Age in years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-29</td>
<td>15</td>
<td>12.8</td>
</tr>
<tr>
<td>30-39</td>
<td>40</td>
<td>31.7</td>
</tr>
<tr>
<td>40-49</td>
<td>40</td>
<td>31.7</td>
</tr>
<tr>
<td>50+</td>
<td>22</td>
<td>17.5</td>
</tr>
<tr>
<td>Female sex</td>
<td>117</td>
<td>92.9</td>
</tr>
<tr>
<td>Highest degree obtained</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Certificate/Diploma</td>
<td>4</td>
<td>3.2</td>
</tr>
<tr>
<td>Bachelor’s</td>
<td>59</td>
<td>47.2</td>
</tr>
<tr>
<td>Entry-level Master’s</td>
<td>37</td>
<td>29.6</td>
</tr>
<tr>
<td>Applied or research Master’s</td>
<td>24</td>
<td>19.2</td>
</tr>
<tr>
<td>Doctoral</td>
<td>1</td>
<td>0.8</td>
</tr>
<tr>
<td>Years in clinical practice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;5</td>
<td>23</td>
<td>18.3</td>
</tr>
<tr>
<td>5-10</td>
<td>31</td>
<td>24.6</td>
</tr>
<tr>
<td>11-15</td>
<td>13</td>
<td>10.3</td>
</tr>
<tr>
<td>&gt;15</td>
<td>59</td>
<td>46.9</td>
</tr>
<tr>
<td>% Time spent in patient care</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>11</td>
<td>8.9</td>
</tr>
<tr>
<td>1-25</td>
<td>12</td>
<td>9.8</td>
</tr>
<tr>
<td>26-50</td>
<td>21</td>
<td>17.1</td>
</tr>
<tr>
<td>51-75</td>
<td>38</td>
<td>30.9</td>
</tr>
<tr>
<td>76-100</td>
<td>41</td>
<td>33.3</td>
</tr>
<tr>
<td>Participates in research</td>
<td>43</td>
<td>34.9</td>
</tr>
<tr>
<td>Serves as a clinical instructor</td>
<td>71</td>
<td>56.8</td>
</tr>
<tr>
<td>Teaching institution</td>
<td>73</td>
<td>58.4</td>
</tr>
<tr>
<td>Major service provided</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neurological</td>
<td>30</td>
<td>23.8</td>
</tr>
<tr>
<td>Consultation</td>
<td>27</td>
<td>21.4</td>
</tr>
<tr>
<td>Other area of direct patient care</td>
<td>24</td>
<td>19.0</td>
</tr>
<tr>
<td>General Service Provision</td>
<td>18</td>
<td>14.3</td>
</tr>
<tr>
<td>Continuing Care</td>
<td>18</td>
<td>14.3</td>
</tr>
<tr>
<td>Mental Health and Addiction</td>
<td>17</td>
<td>13.5</td>
</tr>
<tr>
<td>Geriatric Care</td>
<td>16</td>
<td>12.7</td>
</tr>
<tr>
<td>Musculoskeletal</td>
<td>16</td>
<td>12.7</td>
</tr>
<tr>
<td>Administration</td>
<td>8</td>
<td>6.3</td>
</tr>
<tr>
<td>Primary practice setting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CCAC/Visiting Agency/Client’s Environment</td>
<td>35</td>
<td>27.8</td>
</tr>
<tr>
<td>Rehabilitation Facility/Hospital</td>
<td>24</td>
<td>19.0</td>
</tr>
<tr>
<td>General Hospital</td>
<td>21</td>
<td>16.7</td>
</tr>
<tr>
<td>Children Treatment Centre</td>
<td>9</td>
<td>7.1</td>
</tr>
<tr>
<td>Role</td>
<td>4</td>
<td>3.2</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>---</td>
<td>-----</td>
</tr>
<tr>
<td>Administrator</td>
<td>7</td>
<td>5.6</td>
</tr>
<tr>
<td>Manager</td>
<td>11</td>
<td>8.8</td>
</tr>
<tr>
<td>Owner/Operator</td>
<td>91</td>
<td>72.8</td>
</tr>
<tr>
<td>Service Provider-Direct Role</td>
<td>7</td>
<td>5.6</td>
</tr>
<tr>
<td>Service Provider-Professional Leader</td>
<td>9</td>
<td>7.2</td>
</tr>
<tr>
<td>Consultant (non-client care)</td>
<td>2</td>
<td>1.6</td>
</tr>
<tr>
<td>Instructor/Educator</td>
<td>2</td>
<td>1.6</td>
</tr>
</tbody>
</table>

*aExamples included: Residential/Long Term Care, Association/Government/Regulatory Organization/Non-Government Organization, Community Health Centre.

**Test-retest Reliability and Measurement Error.** The ICC for test-retest reliability was 0.92 (95% CI 0.88-0.95) for the total score and ranged from 0.63-0.84 for item-level scores (Table 3). The SEM computed using the ICC estimate of test-retest reliability was 1.67 %points (n=79) yielding a MDC₉₅ of 4.6 %points and MDC₉₀ of 3.9 %points.
Table 3: Test-retest Reliability (n=79)

<table>
<thead>
<tr>
<th>Item (shortened descriptor)</th>
<th>EPIC score mean (SD)</th>
<th>ICC</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>Retest</td>
<td>Differencea</td>
</tr>
<tr>
<td>1. Identify a gap in your knowledge</td>
<td>86.8 (11.0)</td>
<td>87.2 (9.7)</td>
<td>0.4 (9.0)</td>
</tr>
<tr>
<td>2. Formulate a question to guide a literature search</td>
<td>72.2 (18.9)</td>
<td>72.5 (16.4)</td>
<td>0.4 (12.9)</td>
</tr>
<tr>
<td>3. Effectively conduct an online literature search</td>
<td>67.4 (23.6)</td>
<td>66.8 (20.0)</td>
<td>-0.5 (16.1)</td>
</tr>
<tr>
<td>4. Critically appraise the strengths and weaknesses of study methods</td>
<td>60.8 (23.0)</td>
<td>58.0 (23.3)</td>
<td>-2.8 (14.5)</td>
</tr>
<tr>
<td>5. Critically appraise the measurement properties of standardized tests</td>
<td>57.0 (24.4)</td>
<td>54.6 (25.6)</td>
<td>-2.5 (16.0)</td>
</tr>
<tr>
<td>6. Interpret statistical tests such as t-tests or chi square tests</td>
<td>41.9 (28.1)</td>
<td>39.9 (27.7)</td>
<td>-2.0 (18.4)</td>
</tr>
<tr>
<td>7. Interpret statistical procedures such as linear or logistic regression</td>
<td>36.5 (28.7)</td>
<td>37.6 (29.0)</td>
<td>1.1 (16.3)</td>
</tr>
<tr>
<td>8. Determine if evidence applies to your patient/client</td>
<td>71.8 (21.0)</td>
<td>74.4 (17.8)</td>
<td>2.6 (13.6)</td>
</tr>
<tr>
<td>9. Ask about needs, values and treatment preferences</td>
<td>91.0 (10.1)</td>
<td>91.4 (10.0)</td>
<td>0.4 (13.4)</td>
</tr>
<tr>
<td>10. Decide on a course of action</td>
<td>80.4 (13.7)</td>
<td>80.8 (15.0)</td>
<td>0.4(12.7)</td>
</tr>
<tr>
<td>11. Continually evaluate the effect of your actions</td>
<td>81.2 (14.5)</td>
<td>81.6 (14.8)</td>
<td>0.4 (11.8)</td>
</tr>
<tr>
<td>Total</td>
<td>67.9 (14.9)</td>
<td>67.7 (14.8)</td>
<td>-0.2 (5.9)</td>
</tr>
</tbody>
</table>

Abbreviations: SD, standard deviation; ICC, intraclass correlation coefficient; CI, confidence interval.

aRetest mean-baseline mean.

Internal Consistency. Internal consistency estimated using Cronbach’s α was 0.91 (95% CI 0.89-0.93).

Floor and Ceiling Effects. The percentage of participants reporting no confidence (i.e. 0%) exceeded 15% for 1 of the EPIC scale items: #7: Interpret study results obtained using statistical procedures such as linear or logistic regression (17.5 % points). The percentage of participants
reporting complete confidence (i.e. 100 %points) exceeded 15% for 2 items on the EPIC scale: #1- Identify a gap in your knowledge (25.4 %points) and item #9- Ask about needs, values and treatment preferences (41.3 %points). None of the participants obtained a total score of 0 or 100 %points on the EPIC scale.

Known Groups Construct Validity. Table 4 presents the results of hypothesis testing for construct validation. A significant correlation between EPIC and AFT scores was observed (p=0.21, p=0.02). To better understand the low correlation between the AFT and EPIC scores, the AFT scores were broken down into low (<78/156) and high scores (≥78/156) (Table 5).

Table 4: Hypothesis Testing for Known Groups Construct Validation (n=126)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>N</th>
<th>EPIC score Mean (SD)</th>
<th>EPIC score Median (IQR)</th>
<th>Mean Difference (95% CI)/ U Statistic^a (p value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest Degree</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diploma/Bachelor’s</td>
<td>63</td>
<td>-</td>
<td>64.5 (22.7)</td>
<td>U=1225^a (p&lt;0.001)</td>
</tr>
<tr>
<td>Master’s/Doctoral</td>
<td>62</td>
<td>-</td>
<td>73.6 (16.8)</td>
<td></td>
</tr>
<tr>
<td>EBP education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>36</td>
<td>62.7 (16.1)</td>
<td>-</td>
<td>8.3 (2.2 to 13.9)</td>
</tr>
<tr>
<td>Yes</td>
<td>83</td>
<td>71.0 (13.3)</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Searching research literature</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-1 times/month</td>
<td>83</td>
<td>-</td>
<td>69.1 (24.6)</td>
<td>U=1319^a (p=0.04)</td>
</tr>
<tr>
<td>2+ times/month</td>
<td>41</td>
<td>-</td>
<td>72.2 (18.2)</td>
<td></td>
</tr>
<tr>
<td>Reading research literature</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-5 times/month</td>
<td>104</td>
<td>66.8 (14.4)</td>
<td>-</td>
<td>8.5 (1.8 to 15.3)</td>
</tr>
<tr>
<td>6+ times/month</td>
<td>21</td>
<td>75.3 (13.3)</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Using research literature^b</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-5 times/month</td>
<td>99</td>
<td>66.7 (14.8)</td>
<td>-</td>
<td>7.6 (1.3 to 13.8)</td>
</tr>
<tr>
<td>6+ times/month</td>
<td>26</td>
<td>74.3 (11.8)</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Involved in research</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>80</td>
<td>67.5 (15.2)</td>
<td>-</td>
<td>-0.5 (-6.1 to 5.0)</td>
</tr>
<tr>
<td>Yes</td>
<td>43</td>
<td>68.1 (14.6)</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: SD, standard deviation; IQR, interquartile range; CI, confidence interval.

^aU statistic for non-parametric test. ^bIn clinical decision making.
Table 5: Cross-tabulation of Evidence-based Practice Confidence (EPIC) Scale and Adapted Fresno Test of Competence in Evidence-based Practice (AFT) Scores (n=108)

<table>
<thead>
<tr>
<th>AFT total scores</th>
<th>EPIC total scores (%points)</th>
<th>0-24</th>
<th>25-49</th>
<th>50-74</th>
<th>75-100</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low scorers (0-77 points)</td>
<td>0</td>
<td>9</td>
<td>41</td>
<td>27</td>
<td>77</td>
<td></td>
</tr>
<tr>
<td>High scorers (78-156 points)</td>
<td>0</td>
<td>2</td>
<td>14</td>
<td>15</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>0</td>
<td>11</td>
<td>55</td>
<td>42</td>
<td>108</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: AFT, adapted fresno test of competence in evidence-based practice; EPIC, evidence-based practice confidence scale; %points, percentage points

Discussion

This study reports on the test-retest reliability, measurement error, MDC, internal consistency, floor and ceiling effects and known groups construct validity of the EPIC scale among OTs. Results suggest that the EPIC scale has excellent test-retest reliability and internal consistency. Overall, the EPIC scale does not demonstrate a floor or ceiling effect. High EPIC scale ratings were found to be associated with higher level education, having received the foundations of EBP in their academic preparation, and higher levels of searching, reading and using the research literature. This supports the EPIC scale’s construct validity. In addition, higher EPIC scores were found to be weakly correlated with scores on the AFT.

Reliability is a requirement of validity. The point estimate of test-retest reliability of the total score of the EPIC scale in this study among OTs is slightly higher than the reliability estimate of the EPIC scale observed in physical therapists. This reliability estimate is considered adequate to detect changes in EBP self-efficacy over time among individual OTs. The lower bound of the 95% CI associated with the ICC for the EPIC total score surpasses the minimum value suggested by experts. Change in the total score on the EPIC scale can be interpreted reliably.

Using the standard by Andresen et al. for interpreting point estimates, reliability of items #4 (critically appraise the strengths and weaknesses of study methods), #5 (critically appraise the measurement properties), #6 (interpret statistical tests such as t-tests or chi-square), #7 (interpret statistical procedures such as linear or logistic regression) and #8 (determine if evidence applies to clinical practice) is excellent. Items # 4, 6, 7 were also found to have
excellent reliability in a previous study of physical therapists.\textsuperscript{30} Findings support the relevance of interpreting change of items 4-8 to determine the influence of EBP education on EBP self-efficacy. Reliability for the remaining items were $\geq 0.63$, thus falling in the upper range of the “adequate” range, with the lower bound of the 95% CI ranging from 0.47-0.61. The lower reliability of these items may be due to the lower variability of ratings for these items, which tended to be at the high end of the response scale. Educators and researchers should consider the lower reliability of ratings on these items when interpreting change in scores following a continuing education intervention for these specific items.

An important consideration in evaluating test-retest reliability pertains to the time interval between the two administrations.\textsuperscript{63} The time interval should be long enough to prevent recall bias, and short enough to ensure the stability of the construct of interest.\textsuperscript{63} When stable, any differences generated between the two points in time reflect measurement error associated with scale administration and are not a reflection on true change over time. The median test-retest time interval of 24 days in the current study is longer than the recommended 2-week interval.\textsuperscript{63} The construct of interest in this study, however, can be considered stable as the three responses from individuals who reported participating in an educational event targeted at improving the ability to implement EBP since completing the first EPIC scale were removed from the test-retest reliability analysis. This is a methodological strength of the current study that has not been previously reported in other EBP assessment tools.\textsuperscript{44,78}

The MDC\textsubscript{95} in this study is slightly smaller than that observed for the EPIC scale among physical therapists.\textsuperscript{30} When used to evaluate a continuing education event, the change in an individual’s EPIC scale score must be greater than 4.6 \%points to be interpreted as true change rather than measurement error due to unrelated impacts on EBP self-efficacy when the EPIC scale was completed.\textsuperscript{91}

The internal consistency of the EPIC scale estimated using Cronbach’s $\alpha$\textsuperscript{88} in this study slightly exceeds the value obtained among physical therapists. The internal consistency estimate is interpreted as excellent for the EPIC scale among OTs and indicates high correlations among the items in the scale, thus measuring the same underlying trait.\textsuperscript{89}
The EPIC scale demonstrated no overall floor or ceiling effect. This means that, generally, both people with low versus high level of confidence in EBP can be assessed. However, one EPIC scale (item #7: interpret statistical procedures such as linear or logistic regression) demonstrated a floor effect and 2 EPIC scale items (item #1: identify gap in your knowledge and item #9: ask about needs, values and treatment preferences) demonstrated a ceiling effect. Therefore, caution needs to be used when using these single EPIC scale items to evaluate the effects of continuing education on EBP.

Study results confirmed hypotheses that the mean self-efficacy rating on the EPIC scale would be positively related to level of education, education in EBP, and participation in EBP activities. These results are consistent with results observed in physical therapists’ analysis of construct validity which indicated that average EBP self-efficacy were associated with level of education and engagement in EBP activities. Study findings that average self-efficacy rating was found to be positively associated with previous education in EBP is consistent with previous research suggesting that OTs with previous EBP training (p<0.05) were more confident in their skills for EBP and is in line with Bandura’s self-efficacy theory.

According to Bandura’s self-efficacy theory, self-efficacy and capacity or skill should correlate for the same activity/behavior. A potential reason for the weak correlation between mean EPIC scale scores and mean AFT scores in this study could be related to the possibility that the two instruments used did not contain sufficiently matched items. The EPIC scale’s face and content validity have been established and results suggest that it adequately reflects all the steps of EBP including, generating a clinical question, effectively conducting a literature search, appraising the research evidence, integrating the research evidence into clinical practice and evaluating the outcomes. The AFT does contain items that pertain to formulating a clinical question, searching the research evidence and appraising the research evidence, however, it does not contain items related to integrating evidence into practice or evaluating the outcomes. Furthermore, there are limitations to using a self-report tool to evaluate competency to implement EBP. The AFT asks respondents to recall knowledge and skills and describe how they would use EBP in the context of clinical scenarios. This may not be a true reflection of an individual’s EBP skill level and what they actually apply in practice. A test that involves assessment of EBP competence through direct observation would be more appropriate. Delegates of the Fifth International Conference of
Evidence-based Health Care Teachers and Developers outlined the development of such a test as a top priority. Furthermore, the lower than expected correlation may be due to the low variability in the sample as only 31 out of a potential 108 scored over the “pass” mark on the AFT (Table 4). This may be related to the fact that more than half of the sample were senior therapists who may not have had EBP incorporated in their education curriculum.

The low correlation between EBP self-efficacy and EBP skill and knowledge, however, is consistent with a body of literature that suggests that some healthcare professionals have a limited ability to accurately self-assess. For example, in previous studies on EBP reporting that clinician’s self-perceived competence in EBP correlated poorly with objective assessments of EBP competence. For example, medical students’ self-perceived competence, as measured using a questionnaire, did not correlate well with objectively assessed EBP competence measured using the adapted version of the Fresno test for the searching the research evidence (ρ=0.13, p=0.4) and appraising the research evidence (ρ=0.24, p=0.1). Similarly, the perceived confidence of health professionals in obstetric and gynecology in their level of knowledge of six different literature appraisal issues was found to be poorly correlated (ρ ranged from -0.29 to 0.60) with literature appraisal knowledge in those issues using objective test scores from a series of true or false questions.

Given the poor correlation between perceived EBP competence and objective assessments of EBP competence, researchers in the area of EBP medical education have proposed that self-perceived competence is not a reliable measure of competence in EBP and that it should not be used solely to indicate the effectiveness of an EBP training program. However, self-efficacy differs importantly from the concept of self-assessment currently being utilized in the health professions literature. Self-assessment is often analyzed in terms of the self-concept. Self-concept is an overall view of oneself that is believed to be shaped through direct experience and evaluations. Thus, self-concept judgments are context free, generalized beliefs of self-worth that include self-assessment independent of a specific task. Self-efficacy, on the other hand, is concerned with judgments of personal competence for a specific task, within a specific context. Self-efficacy differs from self-assessment in that self-efficacy is influenced by direct and indirect feedback but is also believed to influence success for a specific task. Therefore, researchers in the area of self-efficacy have reported to be less troubled with the “accuracy of self-assessment”,


but more concerned about its impact on future problem solving situations and its potential to impact and predict future performance.\textsuperscript{100} Thus, one route to improving success with implementing EBP is not through becoming a more accurate self-assessor, but through seeking out mechanisms to increase one’s own self-efficacy for a specific activity.\textsuperscript{100}

Finally, study results did not confirm the hypothesis that the mean self-efficacy rating on the EPIC scale would be 7 %points higher in OTs who report participating in research than those who do not participate in research. A possible explanation for the lack of a significant association could be related to the fact that very few study participants were involved in research related activities. This helps us understand why these activities would not have enhanced self-efficacy considering the mechanisms for improving self-efficacy. Furthermore, one could hypothesize that the research experiences/activities of those who did participate in research did not match the EBP activities covered in the EPIC scale. Perceived self-efficacy is believed to be domain-specific,\textsuperscript{22} thus, self-efficacy and capacity are expected to correlate only if they are for the same domain of activities.

\textbf{Limitations}

The results of the current study should be interpreted in light of some limitations. The initial response rate was lower than expected necessitating a second mailing. However, characteristics of the baseline and retest study samples are similar to those of registered OTs in Ontario\textsuperscript{101} which supports the representativeness of the sample. Furthermore, although baseline and retest demographic characteristics were similar to those of practicing OTs registered with the COTO,\textsuperscript{101} this study was conducted only in Ontario and it unclear whether the results would generalize to OTs in other provinces. However, this sample of OTs is likely to be representative of Canadian OTs as Ontario has the largest number of registered OTs compared to other provinces. Furthermore, the sample was randomly selected which may be more representative than a sample obtained via convenience sampling.

The initial response rate in this study was lower than expected necessitating a second mailing. The response rate among OTs in this study (27\%) is lower than the response rate observed among physical therapists (52\%).\textsuperscript{30} A potential reason for the difference in response rate could be related to the fact that the AFT was added to the questionnaire in order to evaluate the
relationship between EBP self-efficacy and EBP competency for construct validity analysis. The AFT is a 20-minute test and requires thoughtful consideration of high-level EBP concepts. This increased time commitment and task difficulty may have deterred individuals from participating in this study.

Conclusion

The EPIC scale has excellent reliability, acceptable validity and can be considered appropriate to use among OTs to evaluate EBP self-efficacy following a continuing education program that aims to enhance self-efficacy in the acquisition, appraisal, and application of EBP in clinical practice and to assist in understanding EBP self-efficacy among OTs. Finally, given the weak correlation observed between EPIC and AFT scores, further exploration of the relationship between EBP self-efficacy beliefs and EBP knowledge and skill is required.
Implications for occupational therapy practice (this section is required by the American Journal of Occupational Therapy)

Educators leading continuing education programs in EBP require valid and reliable instruments to measure outcomes. Self-efficacy is one of the outcomes being measured.\textsuperscript{2,17} Current measurement tools assessing self-efficacy for EBP in the occupational therapy literature have limited evidence supporting their validity and reliability and reflect a limited range of the EBP steps.\textsuperscript{12-14,16,17,84,85} Findings from this study suggest that the EPIC scale has been found to have excellent reliability, adequate construct validity and no overall floor or ceiling effect among OTs. Thus, this research fills a gap in the occupational therapy literature and suggests that the EPIC scale can be used to measure the impact of continuing education on EBP self-efficacy. Furthermore, the measurement of EBP self-efficacy can provide insight into the factors that motivate individuals to engage in the process of EBP.

Key Messages

- There exists a limited number of reliable measures that can evaluate self-efficacy to implement the steps of EBP in the occupational therapy literature.
- This study has shown that the EPIC scale has excellent reliability, acceptable validity and demonstrates no overall floor or ceiling effect among OTs.
- The EPIC scale can be used for descriptive purposes, to monitor change in EBP self-efficacy over time and as an outcome measure to evaluate the impact of continuing education aiming to increase self-efficacy in implementing the process of EBP on EBP self-efficacy.
- Further research is needed to further investigate the relationship between EBP self-efficacy and EBP skill and knowledge.
Chapter 4
Summary and Conclusion

The purpose of this study was to evaluate the psychometric properties of the evidence-based practice confidence (EPIC) scale\textsuperscript{25,30} among OTs. The aim of this chapter is to further discuss the study findings and how they relate to occupational therapy research, identify study limitations, and suggest avenues for future research.

Findings from this study highlight that the EPIC scale has excellent reliability, acceptable construct validity, and no floor or ceiling effect for the total score among occupational therapists (OTs). Therefore, the EPIC scale can be used among OTs for descriptive purposes and to monitor change in evidence-based practice (EBP) self-efficacy resulting from, for example, continuing education programs on improving self-efficacy to acquire, appraise, and apply research evidence in clinical practice.

Test Retest Reliability and Measurement Error

Specifically, the point estimate of test-retest reliability of the total score of the EPIC scale in this study is deemed sufficient to detect changes in EBP self-efficacy over time among individual OTs.\textsuperscript{90} The intraclass correlation coefficient (ICC) represents the proportion of variance in a set of scores that is attributable to the true variance in scores.\textsuperscript{102} This is useful for EBP educators who wish to measure change in EBP self-efficacy following continuing EBP education programs and to monitor changes in EBP self-efficacy over time. Although the median test retest interval of 24 days (interquartile range (IQR)=19), a high reliability coefficient was detected. Thus, the EPIC scale can be considered reliable among OTs.

The minimal detectible change at the 90\% confidence level (MDC\textsubscript{90}) of 3.9 percentage points (%points) obtained in this study is smaller than the observed MDC\textsubscript{90} value of 5.1 %points among physical therapists.\textsuperscript{71} As a result, a smaller EBP self-efficacy change score among OTs is needed to be considered true change rather than measurement error compared to physical therapists. This confirms that the MDC can vary between populations, albeit, in this case to a small extent. The MDC would need to be verified among additional groups of professionals prior to using it as an
outcome measure as error may be misinterpreted as true change in EBP self-efficacy. Next steps could include exploring the minimal clinically important difference (MCID), which is the smallest amount of change in EBP self-efficacy that might be considered important by healthcare professionals.63

**Floor and Ceiling Effects**

The EPIC scale demonstrated no overall floor or ceiling effect. This means that, generally, both individuals with low versus high levels of EBP self-efficacy can be evaluated and that the EPIC scale has the potential to detect change in EBP self-efficacy in these individuals. However, one EPIC scale (item #7: interpret statistical procedures such as linear or logistic regression) demonstrated a floor effect and 2 EPIC scale items (item #1: identify gap in your knowledge and item #9: ask about needs, values and treatment preferences) demonstrated a ceiling effect. If floor or ceiling effects are present, this means that items scoring in the lower or upper end of the response scale, respectively, are missing. As a result, individuals with the lowest or highest possible score cannot be distinguished from each other at one point in time, thus reliability is reduced.29 Furthermore, if floor or ceiling effects are present, capturing change following an intervention becomes affected. For example, improvements in EBP self-efficacy following an EBP continuing education program may not be detected for individuals who rate themselves as having high EBP self-efficacy at baseline. Similarly, floor effects occur if data cannot take on a lower value than the lowest value on the response scale. Therefore, this may limit the ability of EPIC scale to pick up a decline in EBP self-efficacy as there is no way to detect a decline from the lowest possible score or detect improvement in a person who actually scored lower than zero at baseline. Thus, caution needs to be used when using these single EPIC scale items to evaluate change in EBP self-efficacy.

**Known Groups Construct Validity**

The evaluation of known groups construct validity confirmed hypotheses that the mean self-efficacy rating on the EPIC scale would be associated with level of education, receiving the foundations for EBP in their academic preparation, EBP knowledge and skills and behaviours.
**Education and Training Experiences**

Performance accomplishment is considered the most influential source of efficacy information as it is based on actual experiences of achievement and mastery.\(^{45}\) We hypothesized that clinicians who have had opportunities to successfully execute the steps of EBP following education interventions may feel more confident in their abilities to engage in EBP activities. Current study results support this hypothesis as EBP self-efficacy was found to be higher (and beyond the expected value of 7 % points) for OTs holding a master or doctoral degree compared to OTs with a bachelor degree or diploma (9.1 % points, p<0.001) and for OTs reporting having received EBP education as part of their academic preparation compared to those with no EBP education (8.3 % points, confidence interval (CI)=2.2 to 13.9). This result is consistent with findings in the health professions literature stating that EBP self-efficacy is higher among OTs with higher qualifications than those with lower qualifications\(^{14,16}\) and among physical therapists who report academic preparation in the principles of EBP compared to those who do not have this education.\(^{43}\) The difference in EBP self-efficacy between masters/doctoral graduates and bachelor/diploma graduates may reflect the degree of emphasis on research skills and critical appraisal in programs offered at the master’s or doctoral level. This finding may be explained by the theoretical underpinnings of the self-efficacy theory. Through their professional program, they may have had the opportunity to experience success with, receive positive verbal feedback on, observe others experience success with, and experience a high physiological state with implementing the steps of EBP. This relationship, however, may be more difficult to understand in the future as degree programs gradually change over time. For example, as a result of the current pressure for EBP, current master’s level curriculum may have a greater emphasis on EBP than they did 10 years ago when they were just beginning the transition to the master’s level. Given the expected gradual changes in degree programs, education specific to EBP may be the variable that relates best to EBP self-efficacy as having specific EBP education and opportunity to experience mastery with applying the steps of EBP would be expected to directly increase one’s EBP self-efficacy.

Next steps could include researching the extent to which EBP self-efficacy changes over time among OTs following graduation from professional programs. As time elapses from graduation, confidence for implementing EBP has been found to wane.\(^{14,16}\) For example, years of clinical
experience was inversely related to OT’s confidence with using the Internet as a research tool\textsuperscript{14} and for conducting a literature search.\textsuperscript{16} Thus, evaluating EBP self-efficacy at different time points following graduation from occupational therapy programs may help educators in the area of EBP inform strategies to maintain or enhance specific EBP skill and knowledge among clinical OTs.

Finally, study results did not confirm the hypothesis that the mean self-efficacy rating on the EPIC scale would be higher in OTs who report participating in research than those who do not participate in research. A possible explanation for the lack of a significant association could be related to the fact that very few study participants were involved in research related activities. This helps us understand why these activities would not have enhanced self-efficacy considering the mechanisms for improving self-efficacy. Furthermore, one could hypothesize that the research experiences/activities of those who did participate in research did not match the EBP activities covered in the EPIC scale. For example, if participants were only involved in the recruitment, or intervention aspects of the research project, they may not the opportunity to improve proficiency in performing activities described in the EPIC scale. Perceived self-efficacy is believed to be domain-specific,\textsuperscript{45} thus, self-efficacy and capacity are expected to correlate only if they are for activities that are similar in nature. As a result, this variable may not be relevant for the evaluation of construct validity.

*Behaviour*

Behaviour is difficult to measure. Thus a challenge exists when trying to investigate the association between EBP self-efficacy and EBP behaviours. Three previously tested self-report questions regarding level of attention to and use of the literature, including *searching for, reading/reviewing* and *using the research evidence in clinical decision-making in a typical month*, were selected as a method to measure EBP behaviours.\textsuperscript{30,82}

Although the difference in EBP self-efficacy between OTs that frequently search and those that infrequently *search the research evidence* was statistically significant, it was smaller than projected and may not reflect a ‘true difference’ as it is smaller than the minimal detectible change at the 95% confidence level (MDC\textsubscript{95}) value of 4.5 %points detected in this sample. Results suggest that the majority of the OTs in this study infrequently conduct online literature...
searches. This finding is consistent with findings from a Canadian study suggesting that more than half of study participants reported they rarely or never conducted online literature searches on account of the lack of skills, access or time to conduct searches.\textsuperscript{20} Yet, researchers suggest that experienced clinicians who treat patients with similar problems on a daily basis may not need to frequently conduct literature searches.\textsuperscript{82} Furthermore, given that some health-related journals are published monthly, searching the evidence once a month may be acceptable.\textsuperscript{82} Thus, frequency of times conducting online searches may not be the best way to measure EBP behaviour.

Furthermore, the difference in EBP self-efficacy observed between OTs reading research and using research literature in clinical decision-making 0-5 times in a typical month compared to those reading research and using research in clinical decision making 6 or more times in a typical month was found to be statistically significant and beyond the expected value of 7% points. Results suggest that the majority of the OTs sample in this study infrequently read/review the research evidence and use research evidence in clinical decision-making in a typical month. These study results are in line with the literature suggesting that OTs infrequently read research related to their clinical practice\textsuperscript{12} and often turn to sources other than research evidence when making clinical decisions.\textsuperscript{14,20,79}

In summary, the observed differences between EBP self-efficacy specific EBP behaviours generates useful information of OTs’ application of EBP in daily practice. However, asking OTs to report on the frequency of searching for, reading/reviewing and using EBP in their daily practice may not be the best reflection of one’s successful performance with EBP. Perhaps the use of observational method, like an Observed Structured Clinical Examination (OSCE), would provide us with a more accurate description of actual EBP behaviours and a better comparator measure to explore the relationship between EBP self-efficacy and EBP behaviours. For example, one could be provided with a clinical scenario and observed applying EBP principles to determine the appropriate course of action.

Knowledge and Skill

According to Bandura’s self-efficacy theory,\textsuperscript{22} self-efficacy and capacity or skill are expected to positively correlate with the same activity/behavior. The following section will highlight possible
reasons for the lack of a stronger correlation between mean EPIC and adapted Fresno test of competence in evidence-based practice (AFT) scores.

*Insufficiently Matched Test Items.* A conceivable explanation for the weak correlation between mean EPIC scale scores and mean AFT scores in this study could be related to the possibility that the two measures used did not encompass sufficiently matched items. The EPIC scale’s face and content validity has been established and results suggest that it adequately reflects the five EBP steps including, generating a clinical question, effectively conducting a literature search, appraising the research evidence, integrating the research evidence into clinical practice and evaluating the outcomes. The AFT does comprise items that relate to framing a clinical question, searching and appraising the research evidence, however, it lacks items associated with integrating evidence into practice or evaluating EBP performance. A poor association between self-perceived competence in EBP and self-report competence in EBP has been documented in a study of medical students for both the “searching” (r=0.13, p=0.4) and “appraising” (r=0.2, p=0.1) domains of EBP. In this study, however, self-perceived competence in EBP was measured using a 16-item pilot questionnaire with no supporting evidence of validity or reliability. This questionnaire only focused on 2 EBP domains, namely “searching for evidence” and “appraising the evidence”. Furthermore, the objective measure of EBP competence was an adapted version of the Fresno Test. A limitation in this study is related to the use of a self-report questionnaire that did not sufficiently cover the breath of the EBP domains. Thus, these researchers concluded that further research investigating the correlation between EBP self-efficacy and an objective measure of EBP competence that contains sufficiently matched items that reflect the five EBP steps is warranted.

*Use of a Self-report Questionnaire.* There are advantages and limitations to using a self-report tool to evaluate competency to implement EBP. For example, an advantage to using the AFT lies in its feasibility since performance measures, through direct observation, can be costly and time-consuming in their administration. The AFT asks respondents to recall knowledge and skills and describe how they would use EBP in the context of clinical scenarios. However, the scenarios in the AFT may not align with the patient populations they see in practice and OTs may be better at generating key words if they were more familiar with the scenario. This may not be a true reflection of an individual’s EBP skill level and what they actually apply in practice.
Their responses may also reflect emotional states given the level of difficulty of the AFT. The AFT was completed in a non-supervised setting and thus OTs may not have taken the time needed to perform well in the test. Further research exploring the relationship between EBP self-efficacy, measured using the EPIC scale, with a test that involves assessment of EBP ability through direct observation through use of an OSCE may assist in further understanding the relationship. Perhaps an OT can be presented with a patient and a clinical scenario and the OT would be rated on their ability to apply the steps of EBP. Researchers have identified the development of an EBP assessment that addresses the performance of EBP skills across clinical settings as a high priority.44

Low Sample Variability. The lower than expected correlation between EBP self-efficacy and EBP competence may also be due to the low variability in the sample as only 31 out of a potential 108 scored over the “pass” mark on the AFT (Table 4). This may be related to the fact that more than half of the sample was comprised of senior therapists (>15 years clinical experience) who may not have had EBP incorporated in their education curriculum. As a result, their specific knowledge and skill regarding certain aspects of EBP may be low given the lack of specific EBP instruction.

Self-assessment Ability. Interestingly, 16 out of the 108 participants who completed the AFT and EPIC scales rated their EBP self-efficacy to be low (<75 %points), however, they were found to be ‘high scorers’ (78-156 points) on the AFT. This is of concern as these individuals have the skill and knowledge but lack self-efficacy to implement the steps of EBP. Given that self-efficacy is a predictor of behaviour, steps need to be put into place to increase these individuals’ confidence to implement self-efficacy through mechanisms described by Bandura.22

Furthermore, 27 out of the 108 individuals who completed the AFT and EPIC scales rated their EBP self-efficacy to be high (75-100 %points), despite scoring low (0-77 points) on the AFT. One could hypothesize that these individuals may lack in the ability to self-assess. There exists a body of literature that is consistent with this theory and suggests that some healthcare professionals have a limited ability to accurately self-assess.96 For example, study findings have demonstrated that a clinician’s self-perceived competence for EBP correlates poorly with objective assessments of EBP competence.97-99 For example, physician’s self-ratings of their
understanding of seven terms used in EBP (levels of evidence, relative risk, absolute risk, number needed to treat, test sensitivity, test specificity, and positive predictive value) differed significantly from an objective, criterion-based assessment. In this study, participants rated their understanding of seven EBP terms as “would not be helpful for me to understand”, “I don’t understand but would like to”, “I already have some understanding” and “I understand this and could explain to others.” The last response represented full understanding (self rating of competence). Physicians provided their understanding of the meaning of the EBP terms during interviews. Their responses were rated according to expert criteria.

Given the poor correlation between perceived EBP competence and objective assessments of EBP competence, researchers in the area of EBP medical education have proposed that self-perceived competence is not a reliable measure of competence in EBP and that it should not be used solely to indicate the effectiveness of an EBP training program. However, self-efficacy is very different from the concept of self-assessment presently being employed in the health professions literature. Self-assessment is often analyzed in terms of the self-concept. Self-concept is an overall view of oneself that is believed to be shaped through direct experience and evaluations. Therefore, self-concept judgments are context free, generalized beliefs of self-worth that include self-assessment independent of a specific task. Self-efficacy, in contrast, is concerned with judgments of personal competence for a specific task, within a specific context. Self-efficacy differs from self-assessment in that self-efficacy is influenced by direct and indirect feedback but is also believed to influence and predict success for a specific task. Researchers in the area of self-efficacy have reported to be less worried with the “accuracy of self-assessment”, but more concerned about its influence on future problem solving situations and its potential to impact and predict future performance. This was found to be the case in this current study as those with high EBP self-efficacy were found to be more frequently searching for, reading and using research evidence in their clinical decision-making. Thus, one method to enhance the implementing EBP is not through becoming a more accurate self-assessor, but through pursuing mechanisms, outlined by Bandura, to increase one’s own self-efficacy for a specific EBP activity.
Sample Characteristics

Comparing this study’s sample of OTs to the sample of physical therapists in Salbach and Jaglal’s study assists in understanding this study’s findings. For example, they were relatively similar in terms of their age, gender, years of clinical experience, serving as a clinical instructor, and participating in research related activities. However, the 2 populations differed with respect to their primary practice context. The most frequently cited primary practice setting in OTs was the “Community Care Access Centre (CCAC), Visiting Agency and Client’s environment”. In contrast, the primary practice setting reported by physical therapists in Salbach and Jaglal’s study was in a “private practice/clinic”. The difference in the practice contexts can influence opportunities to improve and ability to sustain EBP competence. Furthermore, physical therapists more frequently searched, read/reviewed and used EBP in their clinical practice compared to the current OTs in this sample. This may be related to the fact that only 64.2% of the OTs in this sample spent >50% in direct patient care, while as 85.7% of the physical therapy sample reported spending >50% of their time in direct patient care. Clinicians involved in direct patient care would likely be those applying EBP principles in their practice. Results suggest that OTs in this sample may not have been in a position to regularly apply EBP steps in their work setting.

Study Strengths

Methodological strengths used in this study are important to recognize. These include the random selection of OTs and the evaluation of stability of EBP self-efficacy during the retest period. The sample in this study was obtained by randomly selecting OTs from an electronic mailing list provided by COTO. This sample may be more representative than a sample obtained via convenience sampling. This supports the generalizability of the results. Furthermore, the 2-item questionnaire that accompanied the retest package aids in evaluating EBP self-efficacy stability. The three OTs who identified participating in an educational activity targeted at improving ability to implement EBP since completing the first EPIC scale were removed from the construct validity analysis. Thus, the construct of interest in this study can be considered stable. This methodological strength that has not been previously reported in other EBP assessment tools.
Future Research

Findings from this study highlight the need to pursue further research in investigating the correlation between EBP self-efficacy and EBP knowledge and skill. Specifically, investigating the correlation between EBP self-efficacy and an objective measure of EBP competence that contains sufficiently matched items that reflect the 5 EBP steps is merited. Furthermore, research exploring the relationship between EBP self-efficacy, measured using the EPIC scale, with a test that involves assessment of EBP ability through direct observation such as through an OSCE may also assist in further understanding the relationship. In addition, future research could include evaluating the extent to which EBP self-efficacy changes over time among OTs following graduation from professional programs. Moreover, another future area would be to evaluate change in EBP self-efficacy among healthcare students throughout professional programs to inform education curricula.

Furthermore, the construct validity hypotheses generated in this study only relate to EBP steps 1-3 of the 5-step EBP model. Developing hypotheses related to EBP step 4 (integrate the research evidence with clinical expertise and patient perspectives) and 5 (ability to self-evaluate one’s effectiveness in using EBP steps) of the 5-step EBP model would add to the assessment of construct validity. This research could help determine if the EPIC scale adequately reflects the breadth of EBP, not just aspects of critical appraisal. Finally, evaluating the EPIC scale’s reliability, validity and floor/ceiling effects in among other health professionals is recommended.

Conclusion

It is widely recognized that EBP is essential in ensuring high quality healthcare. Despite having positive attitudes about EBP, there still exists a gap in moving research findings into practice among OTs. Continuing education is a recommended strategy to assist OTs in adopting EBP in their clinical practice. Educators leading continuing education programs in EBP require valid and reliable instruments to measure outcomes. Self-efficacy is one of the outcomes being measured. Current instruments assessing self-efficacy for EBP in the occupational therapy literature lack evidence supporting their validity and reliability and reflect a limited range of the EBP steps. The EPIC scale has been found to have excellent reliability, acceptable construct validity and can be considered appropriate to use among OTs to evaluate the effects of
continuing education that aims to enhance self-efficacy in applying the process of EBP in clinical practice and to assist in understanding EBP self-efficacy among OTs. In addition, the EPIC scale can be used to monitor change over time in EBP self-efficacy. Finally, given the weak correlation observed between EPIC and AFT scores, further consideration of the relationship between EBP self-efficacy beliefs and EBP knowledge and skill is required.
References


29. Terwee C, Bot SDM, de Boer MR. Quality criteria were proposed for measurement properties of health status questionnaires. *Journal of Clinical Epidemiology*. 2007;60:34-42.


71. Salbach NM, Jaglal SB, Williams JI. Reply to bland: Despite error in formula, EPIC scale still precise. *Journal of Continuing Education in the Health Professions*. Accepted.


76. van der Velde G. Construct validity- HAD 5302H-measurement in clinical research. . 2011.


Appendix A: EPIC Scale

Instructions to Participants

For each of the following activities, please indicate how **confident** you are in your **current** level of ability by choosing the corresponding number on the following rating scale:

- 0% = No Confidence
- 100% = Completely Confident

### Date that you completed the EPIC scale below: _____/_____/_____ dd/mm/yyyy

<table>
<thead>
<tr>
<th>How confident are you in your ability to:</th>
<th>No Confidence</th>
<th>0%</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>90</th>
<th>100% Completely Confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ... identify a gap in your knowledge related to a patient or client situation (e.g., history, assessment, treatment)?</td>
<td>0%</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>70</td>
<td>80</td>
<td>90</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>2. ... formulate a question to guide a literature search based on a gap in your knowledge?</td>
<td>0%</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>70</td>
<td>80</td>
<td>90</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>3. ... effectively conduct an online literature search to address the question?</td>
<td>0%</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>70</td>
<td>80</td>
<td>90</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>4. ... critically appraise the strengths and weaknesses of study methods (e.g., appropriateness of study design, recruitment, data collection and analysis)?</td>
<td>0%</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>70</td>
<td>80</td>
<td>90</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>5. ... critically appraise the measurement properties (e.g., reliability and validity, sensitivity and specificity) of standardized tests or assessment tools you are considering using in your practice?</td>
<td>0%</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>70</td>
<td>80</td>
<td>90</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>6. ... interpret study results obtained using statistical tests such as t-tests or chi-square tests?</td>
<td>0%</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>70</td>
<td>80</td>
<td>90</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>7. ... interpret study results obtained using statistical procedures such as linear or logistic regression?</td>
<td>0%</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>70</td>
<td>80</td>
<td>90</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>8. ... determine if evidence from the research literature applies to your patient’s or client’s situation?</td>
<td>0%</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>70</td>
<td>80</td>
<td>90</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>9. ... ask your patient or client about his/her needs, values and treatment preferences?</td>
<td>0%</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>70</td>
<td>80</td>
<td>90</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>10. ... decide on an appropriate course of action based on integrating the research evidence, clinical judgment and patient or client preferences?</td>
<td>0%</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>70</td>
<td>80</td>
<td>90</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>11. ... continually evaluate the effect of your course of action on your patient’s or client’s outcomes?</td>
<td>0%</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>70</td>
<td>80</td>
<td>90</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>
Appendix B: Adapted Fresno Test of Competence in Evidence-based Practice

ADAPTED FRESNO TEST OF COMPETENCE IN EVIDENCE-BASED PRACTICE

Introduction: Please read the 2 clinical scenarios below. Please select one of the two scenarios and try to answer all of the following questions to the best of your ability. Do not worry if you are unfamiliar with the diagnoses mentioned; this should not affect your answers. The following questions may be challenging, and we understand that you will need to think carefully when answering them. If you are unsure of an answer, please write this in your response.

**The purpose of this test is to gain an understanding of your evidence-based practice skills and knowledge, therefore, please do not use external resources (Internet sites, books, etc.).

Clinical Scenario 1
You have received a referral for a 38-year old male client with chronic low back pain. He sustained his injury at work and is employed as a plumber. You are trying to decide if this man would benefit from using a TENS machine in addition to attending a series of group education sessions on chronic pain management.

Clinical Scenario 2
A 17-year old girl with a traumatic brain injury has been referred to you for advice on memory rehabilitation. She is currently completing her final year high school exams. You are trying to decide if teaching her to use a diary as a compensatory memory strategy would help her function better at school, in addition to her usual strategies.

1. Write a focused clinical question for ONE of the above scenarios, which will help you to organise a search of the clinical literature.

                                                                                                  ________________________________________________________________________________
                                                                                                  ________________________________________________________________________________
                                                                                                  ________________________________________________________________________________

2. Where might you find answers to these and other similar clinical questions? Name as many possible sources of information as you can - not just the ones you think are “good” sources. Describe the most important advantages and disadvantages of each type of information source you have listed.

<table>
<thead>
<tr>
<th>Information source</th>
<th>Advantages of this source</th>
<th>Disadvantages of this source</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3. What type of study (design) would best answer your clinical question (see Q 1) and why?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

4. If you were to search Medline for original research to answer your clinical question, describe the search strategy you might use. Be as specific as you can about which topics and search categories (fields) you would use. Explain your rationale for taking this approach. Describe how you might limit your search if necessary and explain your reasoning.

(a) Write your search strategy in the box below:

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

(b) Explain your rationale for taking this approach?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

(c) How might you limit your search, and why?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

5. When you find a report of original research on this question or any others, what characteristics of the study will you consider, to determine if it is relevant? (Questions 6 and 7 will ask you how to determine if the study is valid and how important the findings are. For this question, please focus on how to determine if it is really relevant to your practice).
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
6. When you find a report of original research related to your clinical question or any others, what characteristics of the study will you consider to determine if its findings are valid? (You’ve already addressed relevance, and Question 7 will ask how to determine the importance of the findings. For this question, please focus on the validity of the study).

7. When you find a report of original research which relates to your clinical question or any others, what characteristics of the findings will you consider to determine their magnitude and significance (clinical and statistical)?

******************************************************************************
Thank you for taking time to complete this test
******************************************************************************

Please initial below to confirm that you have not used any external materials in the completion of this test.

Initials__________
Appendix C: Letter to study participants

September 12, 2011

Name
Address
City, ON, postal code

Dear First name,

We need your help to evaluate the reliability and validity of the Evidence-based Practice Confidence (EPIC) scale developed to measure perceived ability to implement evidence-based practice. This standardized tool will be used to evaluate the effects of education designed to enhance best practice.

We are contacting individuals who are registered with the College of Occupational Therapists of Ontario in the General Certificate Category. If you are eligible and wish to participate, please take 25 minutes to complete the enclosed questionnaires and return them in the business-reply envelope provided. The questionnaires include: (1) the 11-item EPIC scale evaluating perceived ability to implement evidence-based practice, (2) the Adapted Fresno Test which evaluates evidence-based practice skill and knowledge, and (3) additional items to collect sociodemographic and practice information. This information will enable us to evaluate the validity of the EPIC scale. Once we receive your questionnaires, we will mail you the 11-item EPIC scale to complete for a second time (this will take ~5 minutes) so we can evaluate reliability.

Participants are not expected to directly benefit from taking part in this study, other than a possible increased awareness of the evidence-based practice steps. There are no risks associated with participation in this study. Your responses will be kept completely confidential. A unique code will be used to identify your questionnaire and your record in the computer database. Results will only be released in the form of summaries in which no individual’s answers or place of residence can be identified. To ensure confidentiality, your participation will only be known by the principal investigator. No individual level information will be shared with employers or the College. As such, participation in this study will not lead to any penalty. Finally, the data collected will be destroyed after seven years. A one-page report of the study findings will be made available electronically upon request.

Your participation is voluntary. If you prefer not to participate, please return the questionnaire to us in the enclosed business-reply envelope after completing the first item. This will ensure that you do not receive future mailings. If you have any questions or comments about this study, do not hesitate to contact me by telephone at 416-946-7579, or by email at julie.clyde@utoronto.ca.

Sincerely,

Julie Clyde MSc. (OT), OT Reg. (Ont.)  Nancy Salbach, PhD, PT  Dina Brooks, PhD, PT
Principal Investigator  Faculty Supervisor  Faculty Supervisor

P.S. If after completing the first item of the questionnaire you are not eligible or you do not wish to participate, then please leave the rest of the questionnaire blank and return it to us. Thank you for your assistance.
Appendix D: Eligibility Form

BASELINE QUESTIONNAIRE

Project Title: Evaluating the psychometric properties of the Evidence-based Practice Confidence (EPIC) scale among occupational therapists.

Principal Investigator: Julie Clyde MSc. (OT), OT. Reg (Ont.)

Faculty Supervisors: Dr. Nancy Salbach, Dr. Dina Brooks

Affiliation: Graduate Department of Rehabilitation Science, University of Toronto

Eligibility:
1. Are you currently registered with the College of Occupational Therapists of Ontario in the General Certificate Category?

□ 1 Yes □ 2 No

If you answered Yes, please complete the rest of the questionnaire and return it in the envelope provided. Thank you!

If you answered No OR if you answered Yes but do not wish to participate, please leave the rest of the questionnaire blank and return it to us by mail in the envelope provided. This will ensure that you do not receive future mailings. Thank you!
Appendix E: Socio-demographic and Practice Information

1. Date of birth: _____/_____/_____ dd/mm/yyyy

2. What is your gender?
   □ 1 Female  □ 2 Male

3. What is your entry-level degree for occupational therapy?
   □ 1 Certificate
   □ 2 Bachelor
   □ 3 Entry-level Master’s
   □ 4 Other, please specify: _________________________

4. In what year did you graduate? _______ yyyy

5. What is your highest degree attained?
   □ 1 Certificate
   □ 2 Bachelor
   □ 3 Entry-level Master’s
   □ 4 Applied or Research Master’s
   □ 5 Doctoral
   □ 6 Other, please specify: _____________________________

6. For how many years have you been practicing? _____ years

7. In a typical week, how many hours do you work? _____ hours

8. In a typical day, how many patients/clients do you see?
   □ 1 <5  □ 2 5-10  □ 3 11-15  □ 4 >15

9.1 Please indicate the percentage of your total work time that you spend in each type of activity during an average month.
   a) Patient care _____ %
   b) Research _____ %
   c) Teaching _____ %
   d) Administration _____ %
   e) Other, please specify: ________________________ _____ %

9.2 If you are involved in research, which of the following describes your primary role:
   □ 1 Recruiter of study participants
   □ 2 Evaluator of study participants
   □ 3 Provider of treatment for study participants
   □ 4 Investigator in clinical research
   □ 5 Other, please describe: ___________________________________________________________
10. Which of the following best describes the location of the facility in which you perform the majority of your patient care?

☐ 1 Rural (defined as >30 miles or 40 kilometres from a major city)
☐ 2 Urban
☐ 3 Suburban

11. Is your setting a teaching institution (defined as an institution that provides student therapists with clinical rotations/training)?

☐ 1 Yes ☐ 2 No

12. Do you supervise occupational therapy students in your practice?

☐ 1 Yes ☐ 2 No

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

13. I learned the foundations for evidence-based practice* as part of my academic preparation.

*The foundations of evidence-based practice, in brief, refers to converting the knowledge gap into an answerable question, and searching, appraising, and applying the research literature into clinical practice.

☐ 1 Strongly Disagree ☐ 2 Disagree ☐ 3 Neutral ☐ 4 Agree ☐ 5 Strongly Agree

14. Which of the following best describes the major service that you provide?

☐ 1 Mental Health and Addiction ☐ 13 Consultation
☐ 2 Palliative Care ☐ 14 Sales
☐ 3 General Service Provision ☐ 15 Administration
☐ 4 Chronic Disease Prevention and Management ☐ 16 Other area of Direct Service/Consultation
☐ 5 Comprehensive Primary Care ☐ 17 Emergency
☐ 6 Quality Management ☐ 18 Vocational Rehabilitation
☐ 7 Cancer Care ☐ 19 Other Areas
☐ 8 Post-Secondary Education ☐ 20 Critical Care*
☐ 9 Public Health ☐ 21 Acute Care*
☐ 10 Research ☐ 22 Continuing Care*
☐ 11 Client Services Management ☐ 23 Geriatric Care*
☐ 12 Infection Disease Prevention and Control

*If you selected one of the services marked with an asterisk (*), please indicate the primary health condition as described below (only select one).

☐ 1 Neurological
☐ 2 Cardiovascular and Respiratory
☐ 3 Musculoskeletal
15. Which of the following best describes your practice setting?

- □ 1 General Hospital
- □ 2 Rehabilitation Facility/Hospital
- □ 3 Mental Health and Addiction Facility
- □ 4 Residential/Long-Term Care Facility
- □ 5 Children Treatment Centre (CTC)
- □ 6 Community Care Access Centre (CCAC)
- □ 7 Community Health Centre (CHC)
- □ 8 Assisted Living Residence/Supportive Housing
- □ 9 Visiting Agency/Client’s Environment
- □ 10 Family Health Team (FHT)
- □ 11 Independent Health Facility
- □ 12 TeleHealth Ontario or other Telephone Health Advisory Services
- □ 13 Solo Practice Office
- □ 14 Post-Secondary Education Institution
- □ 15 Preschool/School System/Board of Education
- □ 16 Health Related Business/Industry
- □ 17 Group Health Centre (Sault St. Marie)
- □ 18 Cancer Care
- □ 19 Nurse Practitioner-Led Clinic
- □ 20 Board of Health/Public Health Laboratory/Public Health Unit
- □ 21 Group Professional Practice Office/Clinic
- □ 22 Correctional Facility
- □ 23 Other Place or Work
- □ 24 Association/Government/Regulatory Organization/Non-Government Organization (e.g. MS Society)

16. Do you work with an individual/individuals that is/are committed to implementing evidence-based practice?

- □ 1 Yes
- □ 2 No

17. Which of the following best describes your role?

- □ 1 Administrator
- □ 2 Manager
- □ 3 Owner/Operator
- □ 4 Service Provider-Direct Care
- □ 5 Service Provider-Professional Leader
- □ 6 Consultant (non-client care)
- □ 7 Instructor/Educator
- □ 8 Researcher
- □ 9 Salesperson
- □10 Quality Management Specialist

The following questions ask about your perceptions of evidence-based practice (EBP):

18. EBP improves the quality of patient care.

- □ 1 Strongly Disagree
- □ 2 Disagree
- □ 3 Neutral
- □ 4 Agree
- □ 5 Strongly Agree

19. EBP helps me make decisions about patient care.

- □ 1 Strongly Disagree
- □ 2 Disagree
- □ 3 Neutral
- □ 4 Agree
- □ 5 Strongly Agree

20. The adoption of EBP places an unreasonable demand on Occupational Therapists.

- □ 1 Strongly Disagree
- □ 2 Disagree
- □ 3 Neutral
- □ 4 Agree
- □ 5 Strongly Agree
21. EBP improves patient satisfaction with the care they received.
   □ 1 Strongly Disagree □ 2 Disagree □ 3 Neutral □ 4 Agree □ 5 Strongly Agree

22. EBP improves patient recovery.
   □ 1 Strongly Disagree □ 2 Disagree □ 3 Neutral □ 4 Agree □ 5 Strongly Agree

The following questions ask about your activities related to evidence-based practice:

In a typical month, how often do you:

23. Use MEDLINE or other databases to search for practice-relevant literature/research?
   □ 1 0 times □ 2 1 time □ 3 2-5 times □ 4 6-10 times □ 5 11-15 times □ 6 16+ times

24. Read/review research/literature related to your clinical practice?
   □ 1 0 times □ 2 1 time □ 3 2-5 times □ 4 6-10 times □ 5 11-15 times □ 6 16+ times

25. Use professional literature and research findings in the process of clinical decision making? This could include selection of outcome measures or treatment approaches based on research evidence, or the interpretation of scores on outcome measures as suggested in the literature to guide discharge planning.
   □ 1 0 times □ 2 1 time □ 3 2-5 times □ 4 6-10 times □ 5 11-15 times □ 6 16+ times

26. A one-page report of the study findings will be made available electronically in approximately 6-12 months. If you would like a copy of this report, please check off the corresponding box and provide your e-mail address.
   □ 1 Yes □ 2 No
   E-mail address: ________________________________
Appendix F: Test-retest letter to participants

Date

Name
Address
City, ON, postal code

Dear First name

Thank you for completing the Adapted Fresno Test and the first copy of the Evidence-based Practice Confidence (EPIC) scale that was developed to measure perceived ability to implement evidence-based practice. The responses you have already provided will enable us to evaluate the validity of the EPIC scale among occupational therapists. We are now asking you to: 1) complete the EPIC scale a second time so that we may evaluate reliability, and 2) declare if you have participated in any educational initiatives designed to improve your knowledge, skills, or ability to implement evidence-based practice since completing the first copy of the EPIC scale.

Please take 5 minutes and complete the EPIC scale and respond to the question regarding recent participation in evidence-based practice education as soon as possible. It is important that you record the date that you completed the scale in the space provided. Please return the completed EPIC scale and the short questionnaire sheet by mail using the business-reply envelope enclosed. We sincerely appreciate your assistance in this study.

As we stated in our first letter, your responses will be kept completely confidential. A unique code will be used to identify your questionnaire and your record in the computer database. Results will be released only as summaries in which no individual’s answers or place of residence can be identified. Your participation will be known only by the principal investigator and, thus, it will not bring any penalty. No individual level information will be shared with employers or the College. Finally, the data collected will be destroyed after seven years.

Completion of the scale is voluntary. If you prefer not to respond, please let us know by returning the blank scale in the enclosed business-reply envelope. If you have any questions or comments about this study, do not hesitate to contact me by telephone at 416-946-7579, or by email at julie.clyde@utoronto.ca. Thank you again for your time and assistance with this research.

Sincerely,

Julie Clyde MSc. (OT), OT Reg. (Ont.) Nancy Salbach, PhD, PT Dina Brooks, PhD, PT
Principal Investigator Faculty Supervisor Faculty Supervisor
Appendix G: EBP education Questionnaire

Questionnaire regarding participation in evidence-based practice activity

Since completing the first EPIC scale, have you participated in an educational activity targeted at improving your ability to implement evidence-based practice*?

*The foundations of evidence-based practice, in brief, refers to converting a knowledge gap into an answerable question, and searching, appraising, and applying the research literature to clinical practice.

□ 1 Yes □ 2 No

If yes, please provide the following details for each activity that you participated in:

Activity 1:
Date of activity: ____________________________ (dd/mm/yy)

Type of activity: □ 1 Teleconference
□ 2 Course
□ 3 Other, please specify _______________________________

Duration of the activity: ______________________________

Details of the activity:
_____________________________________________________________________________________
_____________________________________________________________________________________

Activity 2:
Date of activity: ____________________________ (dd/mm/yy)

Type of activity: □ 1 Teleconference
□ 2 Course
□ 3 Other, please specify: _______________________________

Duration of the activity: ______________________________

Details of the activity:
_____________________________________________________________________________________
_____________________________________________________________________________________
Appendix H: Ethics Approval from the University of Toronto

PROTOCOL REFERENCE # 25064

April 30, 2010

Dr. Nancy Saibach and Dr. Dina Brooks
Graduate Department of Rehabilitation Science
University of Toronto
160-500 University Ave.
Toronto, ON M5G 1V7

Ms. Julie Clyde
Graduate Department of Rehabilitation Science
University of Toronto
160-500 University Ave.
Toronto, ON M5G 1V7

Dear Dr. Saibach, Dr. Brooks and Ms. Clyde:

Re: Your research protocol entitled, “Evaluating the psychometric properties of the Evidence-based practice confidence (EPIC) scale among occupational therapists”

ETHICS APPROVAL

Original Approval Date: April 30, 2010
Expiry Date: April 29, 2011
Continuing Review Level: 1

We are writing to advise you that a member of the Health Sciences Research Ethics Board has granted approval to the above-named research study, for a period of one year. Ongoing projects must be renewed prior to the expiry date.

All your most recently submitted documents have been approved for use in this study.

Any changes to the approved protocol or consent materials must be reviewed and approved through the amendment process prior to its implementation. Any adverse or unanticipated events should be reported to the Office of Research Ethics as soon as possible.

Please ensure that you submit an Annual Renewal Form or a Study Completion Report 15 to 30 days prior to the expiry date of your study. Note that annual renewals for studies cannot be accepted more than 30 days prior to the date of expiry, as per federal and international policies.

If your research has funding attached, please contact the relevant Research Funding Officer in Research Services to ensure that your funds are released.

Best wishes for the successful completion of your project.

Yours sincerely,

S. Lanthier
Research Ethics Coordinator
Appendix I: Follow up Letter to Participants

Date

Name
Address
City, ON, postal code

Dear First name

We recently mailed you questionnaires for a study of the reliability and validity of the Evidence-based Practice Confidence (EPIC) scale developed to measure perceived ability to implement evidence-based practice. To the best of our knowledge the questionnaires have not yet been returned. If you have recently mailed the questionnaires, we thank you for your time and ask that you disregard this letter.

If the questionnaires have been misplaced or you did not receive copies, please contact Julie Clyde at (416) 946-7579, or via email at julie.clyde@utoronto.ca.

Sincerely,

Julie Clyde MSc. (OT), OT Reg. (Ont.)    Nancy Salbach, PhD, PT    Dina Brooks, PhD, PT
Principal Investigator    Faculty Supervisor    Faculty Supervisor
Appendix J: One-page Summary of Study Findings

Validation of the Evidence-Based Practice Confidence (EPIC) Scale among Occupational Therapists

Summary of Research Findings-Julie Clyde, MSc(OT)

Background. Seeking out, appraising and applying research evidence in clinical decision-making are steps of evidence-based practice (EBP) that are important to providing quality care. Self-efficacy to perform the steps of EBP is expected to influence an individual’s decision to engage in these activities. Self-efficacy refers to a person’s perceptions of his/her capabilities to execute a specific activity. To evaluate and monitor change in EBP self-efficacy among occupational therapists (OTs), valid and reliable instruments are needed. The evidence-based practice confidence (EPIC) scale is an 11-item self-report measure developed to evaluate EBP self-efficacy. The reliability and validity of the EPIC scale, however, has only been examined among physical therapists.

Objectives. To evaluate the test-retest reliability, measurement error, minimum detectable change (MDC), internal consistency, floor and ceiling effects and construct validity of the EPIC scale among OTs. To evaluate construct validity, we tested hypotheses that level of education, education in EBP, EBP knowledge and skill, and participation in EBP activities would be associated with self-efficacy rated on the EPIC scale.

Method. A repeated measures study involving a baseline and a follow-up mail survey was conducted. A random sample of 1077 OTs registered in Ontario, Canada was mailed the EPIC scale and a questionnaire to evaluate construct validity. A second copy of the EPIC scale was mailed on receipt of a completed baseline questionnaire to evaluate test-retest reliability. The total score of the EPIC scale ranges from 0 to 100 %points.

Results. Test-retest reliability, estimated using the intraclass correlation coefficient (ICC), was 0.92 (95% confidence interval (CI), 0.88-0.95, n=79) and is considered adequate to detect changes in EBP self-efficacy over time, such as before and after a continuing education event, among individual OTs. The MDC was 4.5 %points. This means that when used to evaluate change over time the change in an individual’s EPIC scale score must be greater than 4.5 %points to be interpreted as true change rather than measurement error. Internal consistency, estimated using Cronbach’s α, was 0.91 (95% CI 0.89-0.93, n=126). This suggests that all items on the EPIC scale are tapping into different aspects of the same attribute (e.g. EBP). No overall floor or ceiling effect was observed meaning that individuals with low and high levels of EBP self-efficacy can be evaluated. In the evaluation of construct validity, total EPIC score were significantly associated with holding a masters/doctral degree (p<0.001), receiving academic training in EBP (p=0.04), EBP knowledge and skill (ρ=0.20, p=0.02), and searching (p=0.04), reading (p=0.01) and using research findings in clinical decision-making (p=0.02). Confirmation of these hypotheses provides evidence of construct validity of the EPIC scale among OTs.

Conclusion. The EPIC scale has acceptable reliability and validity and is recommended for use among OTs for descriptive purposes and to monitor change in EBP self-efficacy over time and as an outcome measure. Further research is needed to further investigate the relationship between EBP self-efficacy and EBP skill and knowledge.