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continued<sup>ed</sup>

# Important Terms to Know For Understanding Evidence-Based Practice (EBP)

Thomas DiMarco, OTD, OTR/L

continued<sup>ed</sup>

## Learning Outcomes

After this course, participants will be able to

1. Identify types of research study designs based on their description.
2. Identify terms related to research based on their description.
3. Identify general terms related to evidence-based practice based on their description.

## Introduction

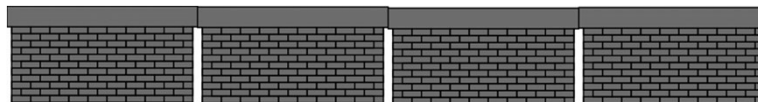
- **EBP for this presentation**
- Textbooks
  - Most recent editions of two EBP research textbooks
  - Law & MacDermid (2014)
  - Portney & Watkins (2009)
- Other books and articles
- Knowledge, experience and credentials
  - Education (BHS, MHS, and OTD, 6 years OT education)
  - Research (EBP in OT curricula)
  - Experience: Teaching EBP and SI courses

(Deangelis, DiMarco, Toth-Cohen, 2013; Law & MacDermid, 2014b; Portney, & Watkins, 2009)

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## Introduction

- **EBP for this presentation continued**
- Literature on barriers to EBP
  - Lack of training for EBP
  - Lack of knowledge of EBP
  - Systematic review of 32 articles (Upton et al., 2014)
  - Scoping review of 31 articles (Ubbink et al., 2013)



(Ubbink, Guyatt, & Vermeulen, 2013; Upton, Stephens, Williams, & Scurlock-Evans, 2014).

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## Introduction

- **Presentation Overview**
- Research study designs
- Research terms
- EBP terms
  
- EBP is a very detailed topic



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## Types of Research Study Designs

- **True experimental**
  - Randomized controlled trial (RCT): gold standard
- **Quasi-experimental**
  - Not randomized or not controlled (or both)
- **Non-experimental**
  - None of the above

(Portney, & Watkins, 2009)

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## Types of Research Study Designs

- **Experimental designs**
  - Completely random design (between subjects)
  - Randomized block design
  - Repeated measures designs
    - Within subjects
    - People act as their own control

(Portney, & Watkins, 2009)

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## Types of Research Study Designs

- **One-way between subject experimental designs (not factorial)**
  - Pretest-posttest control group design
  - Two group pretest-posttest control group design
  - Multiple group (more than two)
  - Posttest only control group design
- **Factorial designs**
- **Block design**

(Portney, & Watkins, 2009)

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## Types of Research Study Designs

- **Repeated measures designs (within subjects)**
  - One-way repeated measures design
  - Crossover design
  - Two-way design with two repeated measures
  - Mixed design
- **Sequential clinical trials**
- **Efficacy versus effectiveness**

(Portney, & Watkins, 2009)

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## Types of Research Study Designs

- **Quasi-experimental Designs**
  - One-group pretest-posttest design (no control)
    - Extension: one way repeated measures over time design (no randomization of treatment)
  - Time series design
  - Non-equivalent pretest-posttest control group design
  - Non-equivalent posttest only control group design

(Biglan, Ary, Wagenaar, 2000; Portney, & Watkins, 2009)

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## Types of Research Study Designs

- **Single Subject Designs**
  - Baseline and treatment phases
  - Standard A-B design
  - Withdrawal A-B-A design
  - A-B-A-B design
  - Multiple baseline design
  - Multiple treatment design



(Portney, & Watkins, 2009)

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## Types of Research Study Designs

- **Exploratory designs (observation)**
  - Prospective and retrospective
  - Longitudinal and cross-sectional
  - Correlational and predictive
  - Case control and cohort studies
  - Methodological
  - Historical research
  - Secondary analysis

(Portney, & Watkins, 2009)

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## Types of Research Study Designs

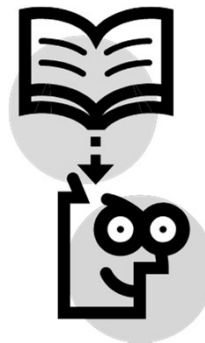
- **Descriptive Research Designs**
  - Developmental research
  - Normative studies
  - Qualitative research designs (phenomenology, ethnography, grounded theory)
  - Descriptive surveys
  - Case studies and case series
  - Surveys and questionnaires (data)
- **Systematic reviews and Meta-analyses**

(Fetterman, 2010; Moustakas, 1994; Portney, & Watkins, 2009)

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## Research Terms

- **Types of research**
  - Experimental
  - Exploratory
  - Descriptive
- **Sources of knowledge**
  - Tradition
  - Authority
  - Trial and error
  - Deductive and Inductive reasoning
  - Scientific method



(Portney, & Watkins, 2009)

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## Research Terms

- **Steps in research process**
  - Research question
  - Design of the study
  - Methods
  - Data analysis
  - Communication
- **Institutional Review Board (IRB)**
- **Informed consent**

(Portney, & Watkins, 2009; Protection of human subjects, 2018)

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## Research Terms

- **Variables**
  - Continuous
  - Discrete
  - Dichotomous
- **Level of measurement scales**
  - Nominal
  - Ordinal
  - Interval
  - Ratio

(Portney, & Watkins, 2009)

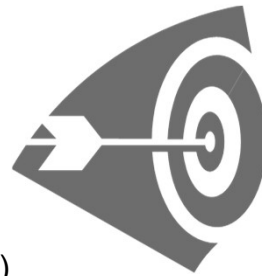
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## Research Terms

- **Reliability and validity**

- **Reliability**

- Measurement error (systematic and random error)
- Regression toward the mean
- Correlation and agreement
- Test-retest
- Interrater
- Intrarater
- Alternate forms
- Internal consistency (homogeneity)



(Portney, & Watkins, 2009)

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## Research Terms

- **Types of measurement validity**

- Face
- Content
- Criterion-related
- Concurrent
- Predictive
- Construct

(Portney, & Watkins, 2009)

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## Research Terms

- **Research related terms**

- Research topic, problem and question
- Gaps and conflicts in literature
- Research question: must be important and answerable
- Feasibility and research rational
- Theoretical framework

(Portney, & Watkins, 2009)

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## Research Terms

- **Variables**

- Independent variable (levels)
- Dependent variable

- **Literature review**

- Primary and secondary sources

- **Hypotheses**

- Research (alternative) hypothesis
- Statistical (null) hypothesis
- Directional hypothesis
- Non-directional hypothesis

(Portney, & Watkins, 2009)

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## Research Terms

- **Probability sampling (random selection)**

- Simple random sampling
- Systematic sampling
- Stratified random sampling
- Cluster (multistage) sampling

- **Non-probability sampling**

- Convenience (accidental) sampling
- Quota sampling
- Purposive sampling
- Snowball sampling

(Portney, & Watkins, 2009)

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## Research Terms

- **Power definition**

- **Characteristics of experiments**

- Manipulation of variables
- Random assignment
- Control group

- **Terms related to data issues**

- On protocol or completer analysis
- Intention to treat analysis
- Non-completer equals failure
- Last observation carried forward
- Follow up



(Portney, & Watkins, 2009)

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## Research Terms

- **Blinding**
  - Double blind
  - Single blind
- **Strategies to control inter-subject differences**
  - Homogeneity
  - Blocking variable
  - Matching
  - Repeated measures
  - ANCOVA

(Portney, & Watkins, 2009)

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## Research Terms

- **Statistical inference**
- **Type I and Type II error**
  - Type I error (rate is  $\alpha$  or level of significance)
  - Type II error (rate is  $1-\beta$  or statistical power of test)
- **Power determinants**
  - Significance criterion, variance, sample size, effect size (ES)
- **Power analysis**
  - A priori analysis and post hoc analysis

(Portney, & Watkins, 2009)

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## Research Terms

- **Statistical testing**
  - Directional and non-directional tests (one or two tailed)
- **Parametric tests**
  - Comparing two means (t-test, two types)
  - Comparing more than two means (ANOVA)
- **Multiple comparison tests**
- **Non-parametric tests for group comparison**
  - Also called a distribution free test

(Abdi & Williams, 2010; Portney, & Watkins, 2009)

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## Research Terms

- **Correlation and regression**
- **Chi-square**
  - McNemar test for correlation samples (for 2x2 tables)
- **Statistical measures of reliability**
  - Intraclass correlation coefficient (ICC)
  - Internal consistency (homogeneity)
  - Response stability (SEM, MDD)
- **Statistical measures of validity**
  - Predictive value, likelihood ratios, clinical prediction rules

(Portney, & Watkins, 2009)

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## Research Terms

- **Statistical measures of validity continued**
- Measuring change: MPDD, MDD, MCID
- Distribution based approach
  - Effect size
  - Standardized response mean
  - Guyatt's responsiveness index
  - SEM
- Anchor based approaches
  - Global rating of change
  - MDD and MCID proportion

(Cook, 2008; Portney, & Watkins, 2009)

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## Research Terms

- **Epidemiology**
- Descriptive epidemiology
- Analytic epidemiology
  - Treatment effect
  - Event rates
  - Number needed to treat
- **Multivariate analysis**
  - Multiple and logistic regression
  - Discriminant, factor, cluster and survival analysis

(Cook & Sackett, 1995; Portney, & Watkins, 2009)

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## Research Terms

- **Data analysis**
- **Communication**
- **Literature** (Search literature, library resources, search engines and databases)
- **Search strategies** (Boolean terms, MeSH headings, limiting or broadening search, truncation and wild cards, sensitivity and specificity of literature searches)
- **Finding references for EBP** (PICO, systematic reviews, reviews and abstracts for EBP, email alerts)
- **Research proposals**

(Portney, & Watkins, 2009; ; Thomas and Mcluskey, 2014)

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## Research Terms

- **Communication continued**
- **Reporting results for clinical research**
- Journal article
- Structure of report
- Poster, oral, and visual presentation (rehearsal)
- **Evaluating research reports**
- Journal quality
- Evaluation of research components
- CATs

(Law & MacDermid, 2014a; Portney, & Watkins, 2009)

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## General EBP Terms

- **EBP terms**
- Definition of EBP
- Critical consumer of research
- Levels of evidence hierarchies
- Standard error of mean (SEM)
- Minimal detectable change (MDC)
- Pearson's  $r$

(Bennett & Bennett, 2000; MacDermid & Law, 2014; MacDermid, Law & Michlovitz, 2014)

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## General EBP Terms

- **EBP terms continued**
- Detecting clinical change
  - Responsiveness
  - Clinically important difference (CID)
    - Previously discussed MCID
  - Effect size (previously discussed)
  - SRM
  - Receiver operator curve (ROC)

(Beaton, et al., 2001; Cook, 2008; MacDermid, Law & Michlovitz, 2014)

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## General EBP Terms

- **Scholarly publications**

- Books
- Peer reviewed journals
- Non-peer reviewed journals and magazines

- **Five step EBP process**

- Clinical PICO question
- Search literature
- Appraise literature
- Decision making
- Assess clinical usefulness

(Lou & Durando, 2014; Thomas and McCluskey, 2014)

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## General EBP Terms

- **Literature search**

- Relevancy: reliability, validity, applicability

- **Databases**

- MEDLINE, CINAHL
- OVID
- Cochrane Library
- OTDBASE, OTSearch, OTSeeker
- PEDro and REHABData
- CIRRIE
- OT CATS (website)

(Lou & Durando 2014)

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## General EBP Terms

- **EBP appraisal tools**
  - Cochrane Collaboration Tool
  - Online critical appraisal tools
- **Systematic appraisal of literature**
  - Narrative and systematic reviews, meta-analyses
  - Cochrane and Campbell Collaboration
  - Meta-syntheses

(Bradley & Law, 2014; MacDermid & Law, 2014)

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## General EBP Terms

- **Other EBP appraisal tools**
  - CATs (5 types) and CAPs
- **Evidence synthesis tools**
  - Clinical practice guidelines, clinical prediction rules, clinical pathways, and patient decision aid
  - <https://www.aota.org/Practice/Researchers/practice-guidelines.aspx>
    - ADAPTE, GRADE, AGREE II, GLIA (<https://www.agreetrust.org/agree-ii/>)
- **Barriers to EBP and facilitators of EBP**

(MacDermid, 2014; Law & MacDermid, 2014a; Ubbink, Guyatt, & Vermeulen, 2013;; Upton, Stephens, Williams, & Scurlock-Evans, 2014;

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