NBASLH Praxis Review Research Methods & Evidence-Based Practice

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Overview of Research Methods and Evidence-Based Practice

- We will go over:
- The Research Process
- ASHA's Code of Ethics and Research
- Evidence Based Practice
- Interpreting Research Articles
  - The Introduction
  - Methods/Methodology
  - Results
  - Conclusions

Overview of Research Methods and Evidence-Based Practice

- Efficacy, Effectiveness, Fidelity
- Treatment Efficacy
- ASHA's NOMS System
- Interpreting Tests and Measurements
- Cultural Diversity

The Research Process

- Research should involve “The Scientific Method”
- The Scientific Method involves ensuring CONTROLS and appropriate identification of VARIABLES when conducting or reviewing research
  - We want to be sure that research we review (including normative information and research on tests we use in our assessments) have followed the scientific method
- Are there appropriate and identifiable RESEARCH QUESTIONS asked in the research we conduct and review?
- What type of research are we conducting or reviewing
- Let’s look at different types of research

Types of Research – Descriptive Research

- Essentially there are three different types of research
- However, there is also MIXED METHODS combining these different types of research
- Descriptive Research = describes things and uses research questions that ask things like “What (about the research topic)?
- What do parents feel about their children’s therapy?
- What differences are observed when we use the ABC method of treatment?
- Who is felt to be the best person to provide evaluations and treatments for the XYZ disorder?
- These are all open-ended questions

Types of Research – Exploratory Research

- Exploratory Research **EXPLORES a RELATIONSHIP**
- **Is there a relationship between X and Y?**
- **Is A related to B?**
- **It does not look at Cause and Effect - but merely is there a relationship**
- **Typically uses CORRELATIONAL statistical analyses**

Types of Research - Experimental

- This is the highest level of research
- Here the scientific method should be used to the fullest extent
- An experiment looks at a Cause-Effect relationship
- Does A cause B?
- Is there a difference between …….?
- Did A occur after treatment? Or what changes/improvements occur after treatment/therapy?
- Does the ABC test really evaluate the XYZ disorder?

Descriptive versus Exploratory and Experimental Research

- Descriptive research may not control all variables
- It chooses specific things to use and investigate, but it looks at how these things function in “natural environments”
- Exploratory and Experimental research DOES control and account of all variables
- It looks at how these variables interact (relationship or cause-effect)
- Exploratory and experimental research is more of the scientific method of conducting research
- There is also MIXED METHODS research mixing designs together

Asking Research Questions

- For descriptive research we ask things like What is? What exists? What do?
- We then gather information (data) and look for THEMES = commonalities and how they rank (most common theme to least common theme to NO theme
- Methods uses are typically questionnaires, surveys, observations, Focus Groups, interviews
  - Questions asked may be open ended or choice questions – mostly open ended
- For Exploratory research we ask is A related to B? or what factors are related to B?
- Methods are typically investigative gathering data (often formal or informal test scores, treatment results, etc. and then comparisons are made such as does test findings relate to ages or differ by age or gender or treatment?

Asking Research Questions - Continued

- In experimental/quasi-experimental research we test out things
- We may use one group pre-treatment versus post treatment
- We may use comparison of two or more groups
- We may use Single Subject Design and look at each individual subject initially – during treatment – and at the end or for carryover
- We use a variety of statistical tests to evaluate if the results are significant

ASHA's CODE of ETHICS and Research

- All four Codes apply to BOTH our clinical work as well as our research
- Three of the four codes specifically state "research" in the code
- But all four codes have research factors in their rules
- Welfare of the persons with who me work and do research is highly regarded
- Professional competence and performance clinically and in research
- Responsibilities to the public – research should be teaching the public
- Responsibilities to our profession and other professions – research should be teaching our colleagues and other professionals
- Research must ensure the researcher is using Responsible Conduct of Research (RCR)

Evidence-Based Practice

- Auds and SLPs should always apply research concepts and evaluate the things they do (evaluations and treatments) supported by EVIDENCE mostly Scientific Evidence
- It is not sufficient to merely use descriptive data – you should use scientifically supported research data for evaluations and treatment
- Be sure that you can site research that supports what you are doing
- Be sure you have your own “evidence” to support what you are doing
- Example: I am doing treatment A because on Evaluation X the person demonstrated disorders/problems with XYZ and treatment A has scientific evidence that it helps to improve problems with XYZ

Evidence-Based Practice Supports

- Use the PICO method where:
- P = Population that has been used in the research (such as the test manual or articles published using the XYZ treatment
- I = Intervention (identifying published research that supports the treatments you are using with the population and disorders on which you are using those treatments
- C = Comparison between pre-tx and post-tx formal test findings including measures you have decided to incorporate during treatment
- C = Comparison also know research that compares what tests or treatments you are using with other tests, treatments, disorders, populations, etc.
- O = Outcomes (what are the results of your test findings or treatments?)

Collecting the Evidence

- To collect evidence to support what you are doing clinically or in a research study, you need to do a review of the literature
- Be sure that you use professional and appropriate journals or books or tests
- Be sure that your methods for evaluating progress have evidence supporting their use
- This then leads to How to Interpret Research Articles
- The first factor is to find appropriate articles to review (whether in doing a research study or in having evidence to support your clinical work
- Is the author(s) known in that field?
- Does the study have good validity?

Reviewing Research Articles and Research in Test Manuals

- The **Introductory Section** presents a review of the problems with a review of previous literature that supports the specific "problem" under investigation
- Be sure the literature sited is appropriate to support the problem and the need for the research that is conducted in the article/research study
- The conclusion of the introductory section should clearly state or imply the specific research question(s) that will be investigated in the remainder of the article/study (may also include the research hypothesis or Null Hypothesis Ho)
- The Methods Section presents what methods were used to complete the study
- The descriptions should have operational descriptions/definitions that can be easily replicated such as things like age, gender, disorder, degree of disorder, IQ, where it was done, the tests used, the treatments provided, etc.

Reviewing Research Articles and Research in Test Manuals - Continued

- Subject size (total and for each subgroup if applicable)
- From where subjects were obtained
- Selection of subjects (random or a group from some specific place, choice, presently involved in therapy, subjects who came for testing, etc.
- Materials used are described and defined and can be replicated
- Procedures of how the study was conducted can be replicated
- How the data were analyzed – statistical methods or descriptive
- Quantitative variables and Qualitative variables
- Quantitative are real numbers and real values
- Qualitative are descriptive but numbers can be applied

Reviewing Research Articles and Research in Test Manuals - Continued

- Example of Quantitative values: they have a real start and a real end such as scores on tests (scaled scores, standard scores, percentiles, number correct out of total, number of errors out of total, percents,etc.
- Example of Qualitative values: degree of disorder (mild-moderate-severe) not based on some numeric value, choices on inventories, surveys which can be changed to numbers such as first, second, third choice or multiple choice same for all subjects then identified as value 1, 2, 3, 4 (but these numbers are not real numbers
- Likert Scales are special survey that use numbers for wording such as in the middle neutral = 0; then Agree= +1 and Strongly Agree = +2 and Disagree = -1 and Strongly Disagree = -2 (Strongly Agree – Agree – No decision – Disagree – Strongly Disagree

Reviewing Research Articles and Research in Test Manuals - Continued

- The results section should provide a complete description of all findings used in analyzing the outcomes from the research conducted
- In descriptive, the results section merely identifies the THEMES
- In Exploratory and Experimental research, the results section should provide the raw data often referred to as the descriptive data such as number of values obtained, ranges of scores, mean values, standard deviations
- Then the statistical analyses are provided – most important factor is the p value or probability
- Statistical measures are based on a null Ho that there is no difference (experimental) or no correlation (exploratory) between factors analyzed
- P values of $p<.05$ (meaning from .05 or lower) indicate there IS a significant difference between what was compared

Reviewing Research Articles and Research in Test Manuals - Continued

- The Conclusion section should be a valid statement supported by the research findings
- Example we compared A with B and found a correlation of p = .01 (which is well below 0.5). Thus, the conclusion is that there is a significant correlation – they are related or there is a significant difference so that the A group performance significantly better (or worse) than the B group
- In the conclusion section, be sure the researcher have answered all of their research questions
- Do the research findings appear to be valid based on the results and methods used?
- Can you apply these research findings to you own research or clinical work?

Reviewing Research Articles and Research in Test Manuals - Continued

- Conclusion section should provide how the findings apply to everyday functioning (therapy, clinical work, evaluations, etc.)
- Conclusion section should also include limitations of the study
- Conclusion section may provide evidence to support the need for your research study such as the researchers in the article did XYZ but they never did ABC so I will do research on similar factors looking at ABC
- Conclusion section may include ideas for future research

Factors in Looking at the Statistical Analyses and Findings

- Understand as best you can the different statistical tools used
- t-tests compare two things
- Independent Samples are two separate groups such as how to Boys perform compared with girls
- Dependent Samples are one group comparing two things such as pre-tx versus post-tx
- Sometimes there are more then two groups or more than two measures for one group
- Then we need multiple t-tests which can be accomplished best via Analysis of Variance (ANOVA)
- Sometimes there are multiple groups and multiple measures = Multiple ANOVA or MANOVA

Factors in Looking at the Statistical Analyses and Findings

- For Correlations we use correlational analyses such as Pearson Correlations also called Pearson Product Moment Correlations
- There are also two types of data that can be used: Real numbers and qualitative values (such as choices) to which numbers are provided
- Real number statistics uses PARAMETRIC Statistics (t-tests, ANOVA, etc.)
- Numbers for things uses NONPARAMETRIC Statistics
- Nonparametric t-tests is the Mann Whitney U Test
- Nonparametric correlations are Spearman Correlations or Spearman Rho
- There are also ANOVA type of nonparametic measures
- Also, there are CHOICE nonparametic measures such as Chi-Square

Research Designs

- There are various types of research designs
- One is Between Groups Design in which you have different groups
- One is Within Group Design in which you have only one group such as pre-tx vs. post-tx
- Mixed Design uses a combination of the two such as one group gets tx and the other gets no treatment (control group) or a different treatment (comparison group) and you compare the pre-tx vs. post-tx for each of the treated groups and then compare the pre-tx between groups and the post-tx between groups
- Single Subject Design uses only one subject for analysis but may have more than one “subject” with each seen only comparing themselves
- This design is still experimental (actually quasiexperimental

Single Subject Design Continued

- In this design there are three main components called A-B-A
- A is the baseline and the End or Carry Over time period
- B is the treatment period
- There is also multiple baseline design or A-B-A-B-A
- The A is initial pre-tx, the first B is treatment 1 and the A is then post-tx 1 as well as pre-tx 2 with the second B being treatment 2 and the last A is post-tx 2 or the end of treatment but there can also be a carryover time like two or three months at the end of treatment for either A-B-A or the multiple baseline designs.

Results of the Research

- The results should be reported to support or refute the research question (example refute the null Ho that there IS a different with the highest value being the better of the two in comparison
- Results have usually two main parts – one is the Descriptive Data usually the mean values for each condition along with the standard deviations and ranges
- Ranges are the lowest value to the highest value
- For nonparametic descriptives, they often just report the NUMBER of values for each factor such as below
- Nonparametric survey choices: Group 1 showed 20% choosing A, 40% choosing B, 30% choosing C and 10% choosing D while Group 2 showed…..etc.
- Then, the results of the statistical tests are provided either in a different column or a different table for either the parametric or nonparametric values

Results Continued

- Parametric test and the values shown
- t-tests would show at least the t values and the p values
- ANOVA and MANOVA would show at least the f values and the p values – then there may be post-hoc tests on the ANOVA and MANOVA to test out which of the various factors in the ANOVA or MANOVA were significant and which were not significant
- Pearson Correlations show the r value and p value
- Nonparametric tests and values shown
- Mann Whitney U test may show the U value or just the p value
- Chi-Square shows the Chi-value and the p value
- Most others show often just the p value
- Spearman Correlations show the r value and the p value

Efficacy, Effectiveness, and Fidelity

- These factors are looked at for Treatment Studies
- Efficacy looks at if the treatment actually works and what BENEFIT one gets from that specific treatment
- Effectiveness looks at what real-world improvements and changes occur
- Fidelity looks at the degree to which the treatment has worked
- For Efficacy Studies the best is a control group comparison
- A comparative group is also sometimes used comparing treatment A with B
- Repeated Baseline Single Subject Design is also used for Efficacy studies
- Meta-analysis is used reviewing what a variety of independent research studies have found putting their data together as one and doing the analysis

What ASHA DOES for Evidence-Based Treatments

- ASHA developed the NOMS = National Outcomes Measurement System
- This system has professionals proving INPUT on their outcomes over a course of time
- If a large group of input is received from ASHA, then the ASHA professional staff can analyze by a Meta-Analysis what are the expected outcomes (Efficacy) of the treatment or test measure being explored

ASHA then publishes that data and the analyses and comments on the treatment or evaluations reviewed

Interpreting Tests and Measurements

- In addition to research specifically on the outcomes from tests regarding the validity of the norms, the materials used, etc.
- We need to consider the Sensitivity and Specificity of the test
- Sensitivity relates to how sensitive is the test in identifying people with the disorder being evaluated? How well does the test “test” the disorder
- Sensitivity is related to the proportion of TRUE POSITIVES versus FALSE POSITIVES
- TRUE POSITIVES = those with the disorder and FALSE POSITIVES are those who fail the test but do not have the disorder
- Specificity is related to the proportion of TRUE PASSES versus FALSE PASSES
- TRUE PASSES are those without the disorder who pass the test and False Passes are those with the disorder who pass the test

Specificity and Sensitivity Table

Disorder	Pass	Fail
Have	% = Sensitivity	% = Specificity
Do Not Have	% = Sensitivity	% = Specificity

Cultural Diversity

- Ethnic Minority Groups = Research Data should consider how different ethnic and cultural groups perform on different tests or with different treatments
- Cultural Diversity must involve not merely ethnic groups but also:
- Cultural Values and Differences from the “standard”
- Beliefs
- Customs
- Language
- The SLP should obtain information about cultural factors from clients and families during interviews and consider these factors in their evaluations and treatments
- Info can also be gained from other sources when appropriate and needed

Conclusions

- ASHA is concerned that researchers are doing appropriate research and making their findings available to the public as well as to others in our profession and other professions
- ASHA is concerned that clinicians use research concepts in understanding research they read or about which they hear and learn to use Evidence-Based Practice (EBP) in their clinical work
- This presentation went over many of the key, important research concepts and factors involved in Evidence-Based Practice as well as in conducting research

The End

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