Demystifying Hearing Research

By Patricia E. Connelly, PhD, CCCA, ABA

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LEARNING OUTCOMES

As a result of attending this activity, the participant should be able to:

1. discuss the concept of peer review;
2. recognize the "Dr. Fox Effect";
3. discuss the necessity to be a discerning consumer of research reports.

To practice as a healthcare professional in the 21st century it's essential to develop a fundamental understanding of the innovations and research that support the use of any new developments, whether those new developments are technology-based as with new equipment, software, or gizmos or they're procedural as with new or revised practice guidelines that are evidence-based. Our livelihoods and the knowledge and skill with which we care for our patients depend on our ability to access the scientific and clinical data that support our approaches to problem solving in hearing care and to debunk the sources of spurious data.

Research need not be mysterious or difficult to understand. You can learn to use it to your professional advantage, and this article will begin to show you how.

What is Research?

Research is the "diligent and systematic inquiry or investigation into a subject in order to discover or revise facts, theories, applications, etc."[1] Please notice that the words "scientific methodology" and "statistics" are not stated in the definition. These concepts can be stumbling blocks for practitioners who avoid research as a professional activity, both conducting it and reading it. Attention and persistence (diligence) are explicit in the definition of research. The research efforts should be planned and methodical (systematic). The use of scientific method is a tool for planning and executing an investigation of some phenomenon or theory. Statistics is another tool for analyzing the data gathered. These same concepts of diligence and planning should be employed anytime we seek information or the answer to a question. This is essential when using the Internet.

Peer Review Process

How are research articles selected for publication? In an attempt to protect the integrity and stature of published research reports, most journals subject submitted manuscripts to a peer review process. The manuscript is sent to experts (peers of the author) in the specific research area who independently read and critique the article and findings. All aspects of the report are scrutinized—the study design, analyses, conclusions, even the organization of the manuscript and grammar! The reviewers make a recommendation to the journal editor as to whether or not the article meets the standards set by the journal for publication. To maintain a fair and unbiased review, most journals use an anonymous system of review blinding the author's name from the reviewers and not disclosing the reviewers' names to the authors.

The reputation of a journal depends on the quality of the research it chooses to publish, and journals are diligent in protecting their reputation. Peer review is a very rigorous process, and it reflects on the researchers who are published, as well. Those who have a significant number of their research reports published in peer reviewed journals enjoy a higher-level of professional celebrity than those who do not have peer reviewed articles in their curriculum vitae. (Typically used in academia, curriculum vitae is a fancy term for résumé.) Publication in peer reviewed journals is prestigious since it means that experts have deemed the report important to the profession.

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Why don't these journals just publish everything that's submitted and let the public decide for themselves about the worthiness of the article? Publication costs are very high, thus limiting page numbers. So, the journal's editor must be very selective about what sees ink. You don't see much advertising in professional peer reviewed journals since advertisers might try to influence what's published, thus introducing financial gain and bias into the selection process. If bad research or pseudoscience gets published, the journal's reputation can be ruined. Since far more manuscripts are submitted than a journal can possibly publish in a year, only the best need be published.

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There are other necessary steps in the process that help maintain the status of a journal and the papers it publishes. Every author must attest to his or her contribution to the project. The days are gone where the department chair gets their name on the paper simply because they're the boss! Real or potential conflicts of interest must be disclosed to the reader. If a pharmaceutical company or medical equipment manufacturer funded a study, that fact must be disclosed since this fact needs to be considered relative to the results and recommendations. Finally, all authors must concur with the findings and conclusions.

So, the peer review process establishes that a scholarly work meets the standards of a discipline. Consumers of information from such refereed journals can have some measure of confidence in that information, the results, and conclusions.

Sources of Information

Before continuing, I need to mention access to a computer. Every hearing care professional **must** have a computer with Internet access in his/her office. Few valid excuses remain for not having one. Training is available through evening adult education programs, so even the most severe case of "technophobia" can be cured in a matter of weeks in a very user-friendly economic way. A computer not only allows us the fastest way possible to communicate and interact with others in our profession, but it also provides endless opportunities for top-notch continuing education and immediate gratification when it comes to answering questions and looking for information.

Three sources of information are readily available to every professional. There are primary and secondary sources, and the Internet is the third available resource. As it pertains to medical, scientific, or human research, a primary source provides information directly from the investigator. The most commonly used primary source is the journal article or abstract that describes the results of original research. Journal articles and scientific reports provide the foundation for evidence-based practice, a concept that is being embraced on an ever-increasing scale by all healthcare practitioners.

Secondary sources interpret and compile original research findings. The most common example of a secondary source is a textbook. Another example is a review article that may appear in a professional journal. A review article presents a synthesis of the research to date on a specific topic.

Last, but certainly not least, is the Internet as a source of information. It has transformed access to information and medical research into a full-time tool, always-open-for-business and available to everyone with a connection. With the exception of special subscriptions available primarily to academicians, your patients have the same access to hearing care information that you do. As a result, they expect you to know what they know. Further, they rely on you to be their expert—not an unrealistic expectation since they are trusting their hearing to you.

Primary and secondary sources are presented on the Internet, as well as sources of opinion, misinformation, pseudoscience, and nonsense. The validity and reliability of the information found on the Internet are not assured, even when the information is taken from prestigious sources. Falsified results in science and medicine are certainly not a rarity. Results can be innocently misinterpreted out of ignorance or intentionally spun for profit or political gain. Critical appraisal by you is required when it comes to addressing the concerns of your patients or incorporating contemporary science into your practice patterns. The more you know, the better equipped you are to determine the value of the information you gather.

Even though there are safeguards in place to prevent deceptive or patently false research from being reported, it still happens. The prestigious journal *Science* retracted two papers by a South Korean scientist who fabricated evidence that he cloned human cells. The *New England Journal of Medicine* reported that it suspected that two papers it had published on cancer research contained fabricated data.

In 2000 the *New England Journal of Medicine* published a report on the drug Vioxx that had omitted the fact that several subjects suffered heart attacks while taking the drug and participating in the research. Physicians read this report and based on its findings prescribed the medication with a reasonable expectation that the drug was safe. The liability is enormous for the physician, the pharmaceutical company, and the journal. Such an omission of fact is egregious.

Recently, the very popular publication *Consumer Reports* revealed that studies it had conducted on the safety of baby car seats had faulty methodology—the studies were actually run at excessive speed. The published report tainted the safety reputation of a number of car seats. Consumers were hurt in that many replaced the seats they believed compromised their children's safety—money they clearly did not have to spend given the bad methodology used and erroneous conclusions published.

Can We Trust What We Read?

News outlets have become increasing skeptical. The venerated *New York Times* published an article on February 13, 2006, "Reporters Find Science Journals Harder to Trust, but Not Easy to Verify" by their reporter, Julie Bosman. It's ironic that the *New York Times* should be skeptical about published scientific and medical findings considering the media flap over their own former reporter, Jayson Blair, who left the paper in disgrace after he fabricated information in several of his reports.

Do these examples of scientific misconduct mean that circumstances are dire for our trust in scientific and medical research? No, they don't. In fact, the mere appearance of such errors indicates that watchdogs are present within the scientific and medical communities as well as in the mainstream media. Published research is the best approximation of acceptance by knowledgeable people, so it remains credible and we can have confidence in the research reports we read for the most part. This is how advances and new discoveries in science and medicine are communicated. Frauds will be outed, and scientific misconduct will be caught.

Although our patients do not typically read our professional literature, they're nonetheless affected by published research insofar as it appears in the mainstream media, interpreted rightly or wrongly by a science reporter and editor. The *Boston Globe* has reported that two out of three of its science stories on a typical day are from research reported in science or medical journals. Half of the front-page stories in the *Los Angeles Times* are science stories from journals.

When a researcher's paper is peer reviewed and deemed publication-worthy, there's nothing obviously false. However, unless and until the study is independently replicated, these results, conclusions, and their applications to patient care and treatment should be applied with caution. Independent replication is a necessity in science. Unfortunately, the fame and glory go to the first reporter, not to the researcher who replicates the initial result. It's more interesting to take another path than to repeat someone else's methodology. It's also easier to get the necessary funding for a new avenue of inquiry than to repeat something already peer reviewed and in the mainstream media even if that work may be the exception or the statistical fluke rather than the rule.

Is There a Higher Authority?

Notorious research abuses led to federal regulations and globally accepted considerations about the safe and ethical conduct of research. The famous Nuremberg Trials took place after World War II to investigate and punish those responsible for the brutal human experimentation conducted by Nazi physicians and scientists on unwilling subjects in concentration camps. The Tuskegee Syphilis study was another episode where patently unethical and scientifically unjustifiable research was conducted from 1932–1972 by the US Public Health Service on poor, illiterate black men in rural Alabama.

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In 1964 the World Medical Association published the "Declaration of Helsinki: Recommendations Guiding Medical Doctors in Biomedical Research Involving Human Subjects." It received global reaffirmation in 1975, 1983, and 1989. In 1979 the Belmont Report was published by a US national commission as "Ethical Principles and Guidelines for the Protection of Human Subjects." The Research Act of 1974 was passed by Congress and enacted to protect human subjects. The Federal Department of Health and Human Services has an Office for Human Subjects Protection that regulates all research that's either directly or indirectly funded by the federal government through an approval and monitoring program. Further, the Food and Drug Administration requires that all human-subjects research be reviewed by an independent ethics committee to ensure protection of subjects and their personal health identifiers.

Every medical school has an Institutional Review Board (IRB) that ensures that researchers comply with federal regulations. There are also private IRBs that are used by industry and private practitioners. Many journals will not even review a manuscript unless the corresponding author stipulates that the research has been approved by an IRB. IRB review considers a proposed study's scientific merit, adherence to safety, ethical standards of beneficence, respect for persons, and justice, and its informed consent process and documentation.

So, there *is* a higher authority that allows us to enjoy confidence in reports that have been peer reviewed and appear in our professional journals. Having submitted research proposals to my medical school's IRB, I can tell you that it's a process with extreme rigor and many built-in controls. In compliance with the federal requirements for research involving human subjects, the research proposal is reviewed by a number of scientists as well as a member of the public to determine whether the proposal adequately addresses issues of safety, informed consent, and protection of subjects' personal health identifiers, among other items. Care is also taken to evaluate the appropriateness or worthiness of the proposed research. The results of the investigation, conclusions, and applicability to patient care are typically judged by the peer reviewers who evaluate the study for presentation at a scientific meeting or for publication in a journal, not by the IRB panel, so there's another layer of protection built into the process even before a paper sees ink.

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Can We Trust What We Hear?

Clearly, peer reviewed journals have a structure in place for evaluating the scholarly merit of research before it's published, and we can enjoy a good measure of confidence in this system. Typically, some form of peer review also takes place when speakers for conventions or other professional meetings are selected to present topics in their area of expertise or particular interest.

However, there's often a disconnect between the presentation that's proposed and the actual performance itself. The panel responsible for selecting the speaker does so based on an abstract submitted by a potential speaker. What and how the speaker actually delivers the information can be quite different than anticipated in terms of topic and in terms of validity, veracity, or legitimacy of the material presented. In other words, great or entertaining speakers can deliver presentations filled with conclusions drawn from poorly designed and conducted research or can make statements of "fact" based on their own misperceptions of reality. We believe them because they're presenting and **must** know what they're talking about! We have an expectation that what they say is truthful, valid, and based on robust adherence to scientific method simply because other people (convention committees, for example) have deemed them to have expertise that's worth sharing. However, this is not always the case and, as with written research reports, the level of complexity of the presentation is not indication of the validity or reliability of the information delivered.

What I'm referring to here was termed "educational seduction" in 1973 by the research group that studied the phenomenon.[2] Here's what they did. Three medical school professors (two psychiatrists and one professor of medical education) wrote a lecture, "Mathematical Game Theory as Applied to Physical Education." The lecture was actually no more than a hodgepodge of phrases from *Scientific American* that were strung together with buzzwords and absurdisms, contradictory statements, jokes, and meaningless references to unrelated topics. They hired an actor to play "Dr. Myron L. Fox" and trained him to deliver the lecture and address questions from the audience. Dr. Fox used superior presentation skills—an authoritative voice and professorial body language—that were reinforced by an impressive but bogus curriculum vitae. He delivered the lecture to a group of educators, school administrators, psychiatrists, psychologists, and social workers. The post-event evaluations revealed that 80% of the audience rated Dr. Fox "an outstanding psychiatrist" and agreed that "he used enough examples to clarify the material," and that the lecture was well-organized and stimulated their thinking! No one questioned his authenticity on the evaluation sheets.

One of these researchers conducted a subsequent experiment on educational seduction using the same actor that played Dr. Fox.[3] The results of this second study indicated that the "Dr. Fox Effect" was not an aberration. They analyzed student satisfaction ratings (presentation effectiveness) and test achievement from instructional videos that had low versus high seduction lectures and low versus high

content. They found that seductiveness (the lecturer's expressive behavior) affects a learner's impression of the expertise of the lecturer. So, they validated their earlier findings and this phenomenon of educational seduction as the "Dr. Fox Effect."

This issue of educational seduction is important to consider when attending a live lecture or presentation. Just because a presentation sounds erudite or is very entertaining does not guarantee that the content is based on the best evidence in the field. A presenter can sound very authoritative but the information may be no more than opinion, unsubstantiated impression, misinterpretation of data, or an attempt at self-aggrandizement. As with published material, a bit of skepticism is healthy and a little bit of fact checking is prudent before you apply any new-found "knowledge" to your clinical practice.

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Summary

The word "research" does get some people freaked out, but it's really not all that bad! In fact, it's very good because innovations and evolutions in hearing science are based on scholarly efforts that are scrutinized by experts in our field, communicated to us at convention lectures, and appear in our professional journals. It is research that validates the products and procedures we use to fit hearing aids and assistive technologies and to prove that these interventions really do increase the functionality of our patients.

Don't let the examples of scientific misconduct and the Dr. Fox Effect shake your trust in the research process. They are the exceptions, not the rule. My intent was to foster a healthy doubt, an unwillingness to believe without further proof. Have confidence in what you read in peer reviewed journals. Consider publications in peer reviewed journals as a sign of superior achievement on another professional's résumé or curriculum vitae. Listen carefully at lectures, but be aware of the "Dr. Fox Effect."

I'll end with a quote from Dr. David Suzuki, Canadian geneticist, science broadcaster, and environmental activist: "Education has failed in a very serious way to convey the most important lesson science can teach: skepticism." *THP*

References

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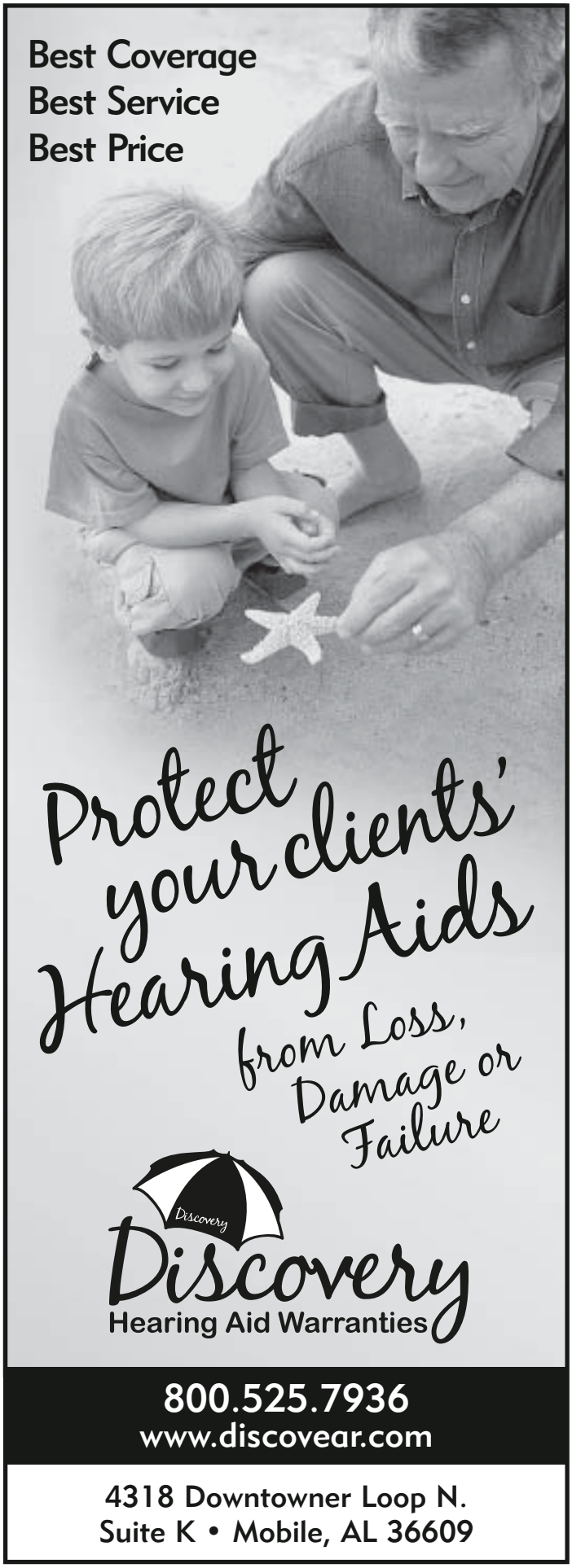

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1. Research is:

a. statistics.
b. diligent and systematic.
c. a random activity.
d. rarely applicable to treating people with hearing loss.
e. an activity only engaged in by medical school professors.

2. The peer review process:

a. is where members of the public judge the value of a research report.
b. results in publication by *The New York Times*.
c. depends on funding by the National Institutes for Health.
d. determines whether a research report meets the standards of a discipline.
e. is only performed by erudite journals.

3. Conflicts of interest in medicine and science:

a. can introduce bias.
b. can eliminate bias.
c. have no influence on the interpretation of results.
d. must be reported to the licensing board.
e. are not a problem in the reporting of hearing research.

4. A primary source of information is:

a. folklore.
b. the Internet.
c. a newspaper.
d. a textbook.
e. a journal article.

5. A secondary source of information is:

a. folklore.
b. the Internet.
c. a newspaper.
d. a textbook.
e. a journal article.

6. The Internet:

a. displays only primary sources of information.
b. displays only secondary sources of information.
c. displays no credible information.
d. is a very useful tool for hearing research.
e. should be used only by trained professionals.

7. Research subjects are protected by:

a. federal law.
b. a researcher's compliance with IRB directives.
c. informed consent.
d. the researcher's good intentions, only.
e. a, b, and c above.

8. The "Dr. Fox Effect" is also known as:

a. educational seduction.
b. a fairy tale.
c. a protection of human subjects.
d. a noted psychologist.
e. Carhart's notch.

9. Research:

a. is essential to the growth of a discipline.
b. is the foundation of evidence-based practice.
c. is important to understand.
d. should be consumed with a measure of healthy doubt.
e. all of the above.

10. Errors in research:

a. are all intentional.
b. can be caught by the peer review process.
c. are rampant in our discipline.
d. are not harmful.
e. can all be attributed to Dr. Fox.

DEMYSTIFYING HEARING RESEARCH—JANUARY/FEBRUARY 2007—DEADLINE: FEBRUARY 2008

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ANSWER SECTION

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1.	a	b	c	d	e	6.	a	b	c	d	e
2.	a	b	c	d	e	7.	a	b	c	d	e
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