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Science vs. Pseudoscience in Speech-Language Pathology: Tools for Skeptical Thinking

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Quackery

- A type of pseudoscience; any practice or remedy that has no compelling scientific basis for them to work. Includes questionable ideas and questionable products and services, regardless of the sincerity of the promoters.
- A charlatan is a person who pretends or claims to have more knowledge or skill than s/he possesses, knows that his/her skills are not real, uses deception and usually does things to obtain money, fame or other advantages.
- **Why Fad Therapies Exist** (Vyse, 2005): ♦Incomplete effectiveness of available therapies ♦Available treatments may be onerous or distasteful ♦Alternative treatments are supported by ideology ♦Treatments are promoted by proprietary groups.
- **Why Bad Therapies Persist** (Lilienfeld, Marshall, Todd & Shane, 2015): Ineffective techniques may persist long after they have been debunked; we assume we can "demolish a notion with scientific data", but erroneous ideas won't disappear ("Zombie Psychology"). Here is why these ideas may persist: ♦Desperation ♦Poor sources of information ♦Seductive appeal ♦Savior effect ♦Naïve realism ♦Personal experiences ♦Confirmation bias ♦Cognitive dissonance ♦Profit.

Skepticism

- A skeptic is a person who has a questioning attitude or has some degree of doubt regarding claims that are taken for granted elsewhere.
- The word *skepticism* can characterize a position on a single claim, but more frequently it describes a lasting mindset.
- Skepticism is an approach to accepting, rejecting, or suspending judgment on new information that requires the new information to be well-supported by evidence**.** "Extraordinary claims require extraordinary evidence."
- **Skeptic's Society:** Under the direction of Dr. Michael Shermer, The Skeptic's Society is a scientific and educational organization of scholars, scientists, historians, magicians, professors, teachers, and anyone curious about controversial ideas, extraordinary claims, revolutionary ideas, and the promotion of science. The mission is to serve as an educational tool for those seeking clarification and viewpoints on these controversial ideas and claims.
- **Skeptics' Balancing Act:** Openness to new ideas, no matter how bizarre or counterintuitive vs. a ruthlessly skeptical scrutiny of all ideas, old and new.
- **Are Skeptics Curmudgeons?** "Some people believe that skepticism is the rejection of new ideas, or worse, they confuse 'skeptic' with 'cynic' and think that skeptics are a bunch of grumpy curmudg-eons unwilling to accept any claim that challenges the status quo. This is wrong. Skepticism is a provisional approach to claims. It is the application of reason to any and all ideas — no sacred cows allowed. In other words, skepticism is a method, not a position. Ideally, skeptics do not go into an investigation closed to the possibility that a phenomenon might be real or that a claim might be true. When we say we are 'skeptical,' we mean that we must see compelling evidence before we believe."

Thinking Errors (Finn, 2011)

- **Common Thinking Errors:** There are a variety of thinking errors that we are all susceptible to and play a role in making decisions. Only when we are aware of these or are instructed how to think differently, then these errors can be reduced or eliminated.

- **Three Defining Characteristics:** (1) They typically lead to judgments that are different from the optimal choice, dissimilar from objective reality; (2) They happen automatically so we do not realize they are occurring; (3) They are often difficult to avoid.
- **6 Common Thinking Errors:** (1) We are more likely to be persuaded by personal experience and anecdotes than by objective, statistical evidence; (2) We prefer evidence that supports our beliefs and ignore or downplay evidence that questions them; (3) We are prone to ignore the role that chance events play in our everyday lives and, instead, erroneously assign them to causal status; (4) We believe we see the world as it is, failing to appreciate that our senses can be deceived and that our expectations can shape our perceptions; (5) We oversimplify our thinking, such that we fail to look beyond the obvious, overgeneralize, and engage in either-or thinking—when multiple potential answers are more likely; (6) We believe that our memories are faultless, when in fact they are imperfect because they are often readily influenced by our current beliefs and expectations and are highly suggestible to questioning.
- **10 Common Flaws in Thinking** (Travers, 2016). (1) Confirmation bias; (2) Appeal to faith; (3) Argument from ignorance; (4) Anecdotal evidence; (5) Correlation fallacy; (6) Shifting the burden of proof; (7) Appeal to authority; (8) False authority; (9) Argument to moderation; (10) Ad hominem. See chart on Page 16.
- **20 Cognitive Biases that Affect Your Decisions.** (1) Anchoring bias; (2) Availability heuristic; (3) Bandwagon effect; (4) Blind-spot bias; (5) Choice-supportive bias; (6) Clustering illusion; (7) Confirmation bias; (8) Conservatism bias; (9) Information bias; (10) Ostrich effect; (11) Outcome bias; (12) Overconfidence; (13) Placebo effect; (14) Pro-innovation bias; (15) Recency; (16) Salience; (17) Selective perception; (18) Stereotyping; (19) Survivorship bias; (20) Zero-risk bias. See graphic on Page 15.

Avoid Being Quacked

- Quackery seldom looks outlandish.
- Be skeptical of anecdotes and testimonials: Testimonials are not science.
- Be wary of pseudoscientific jargon: Make sure that the uses of terms are following accepted standards.
- Be skeptical of claims of effectiveness for a wide range of unrelated problems: There is no such thing as a "cure-all."
- Don't let desperation and enthusiasm cloud your judgment.

Science and Pseudoscience

- **Science:** Information that is developed through research and other empirically-based activities. Science is a philosophical doctrine that specifies criteria and standards for describing, explaining, and deciding what stands as real knowledge or truth. It is a quest for knowledge supported by evidence, and an attempt to discover and explain regularities in events (Lum, 2002).
- **Pseudoscience:** A pretend or spurious science; a collection of related beliefs about the world mistakenly regarded as being based on scientific method or as having the status that scientific truths now have (Finn, Bothe, & Bramlet, 2005). A methodology, belief, or practice that is claimed to be scientific, or that is made to appear to be scientific, but which does not adhere to appropriate scientific methodologies, lacks supporting evidence or plausibility, or otherwise lacks scientific status.
- **Markers of Good Science/Guide to Bad Science:** See graphics on Pages 11 and 12.

How You Know Something is Pseudoscience (Finn, Bothe, & Bramlett, 2005)

- Disconfirming evidence is ignored and practice continues even though the evidence is clear. Once we have evidence against a procedure, then it cannot be ignored in clinical practice. Must be careful of Confirmation Bias, where we pay more attention to things that fit with our beliefs than things that might challenge them. No matter what the evidence shows, many people will not give up on their prior beliefs.
- When the approach is disconnected from well-established scientific models, theories, or paradigms. If theories are ignored, re-interpreted/misinterpreted, or manipulated in some way, then it is probably pseudoscience.
- When new terms are invented or the meanings are redefined in nonstandard ways.
- The only "evidence" is anecdotal, supported with statements from personal experience. A case study does NOT establish a cause/effect relationship and anecdotes and stories are NOT science.
- Inadequate evidence is accepted. Many proponents of some treatments provide insufficient evidence of their benefits.
- The printed materials are not peer-reviewed. Have the claims undergone independent, unbiased critical scrutiny? Or are the results presented directly to the public (e.g., at a conference, CEU event, self-published website/books)?
- Grandiose outcomes are proclaimed. If it is too good to be true, it probably is not true! One therapeutic technique cannot possibly work for all different types of disorders.

Is it Real of Fake Science? 10 Questions (Forbes Magazine, 2012)

1. **What is the *source*?** Is the person or entity making the claims someone with genuine expertise in what they're claiming? Are they hawking on behalf of someone else? Do they use a website that's made to look "sciencey" or newsy when it's really one giant advertisement for something that is being marketed to you?
2. **What is the *agenda*?** You must know this to consider any information in context. In a scientific paper, look at the funding sources. If you're reading a non-scientific anything, remain extremely skeptical. What does the person or entity making the claim get out of it?
3. **What kind of *language* is used?** Does it use emotion words (miracle cure)? Or use language that sounds highly technical (jaw slide! enzymes! brain mapping!) or jargon-y but is really meaningless in the therapeutic or scientific sense? If you're not sure, take a term and Google it. Be on the lookout for sciencey-ness. If peddlers feel that they have to toss in a bunch of jargony science terms to make you think they're the real thing, they probably don't know what they're talking about.
4. **Does it involve *testimonials?*** If all the person or entity making the claims has to offer is testimonials without any real evidence of effectiveness or need, be very, very suspicious. Anyone can write a testimonial and put it on a website. If the only thing "showing" effectiveness are testimonials, then you know the science is not there.
5. **Are there claims of *exclusivity*?** New findings arise out of existing knowledge and involve the contributions of many people. It's quite rare that a new therapy is something completely novel without a solid existing scientific background to explain how it works. Watch for words like "proprietary" and "secret." These terms signal that the intervention has likely not been exposed to the light of scientific critique.
6. **Are there mentions of *conspiracy*?** Do they use words like *"...only clinicians know how to do this, not those in the ivory towers*." Is there a belief that they are the only ones in the know? Is there a sense they feel like they are being put down or suppressed because of their unique approach?

7. **Does the claim involve multiple *unassociated* disorders?** Does it involve assertions of *widespread therapeutic benefit* for unrelated disorders? Claims that a specific intervention will cure cancer, allergies, ADHD, and autism are frankly irrational.
8. **Is there a *money trail* or a *passionate belief* involved?** It is always important to follow the money. The ones who benefit financially are those who market cures or therapies, act as consultants, and/or give paid talks. Because of all of our biases and our passion for improvement, we often fail to be as skeptical as necessary.
9. **Were real *scientific processes* involved?** Is there evidence that the product or intervention on offer has been *tested scientifically?* Were the results published in scientific journals? Was there true peer-review that is unbiased? Be careful of self-published books, websites, etc.
10. **Is there *expertise*?** No matter if you dislike "experts" or disbelieve the "establishment", these people have studied the topic deeply. The dichotomy of "clinician vs. researcher" is mostly a false one in speech-language pathology. Just because someone has a PhD does not necessary make them an expert.

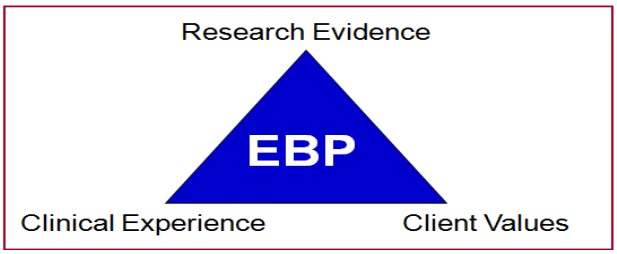
- **Science vs. Pseudoscience in CSD: A Checklist for Skeptical Thinking** (Lof, 2012). See chart on Pages 13-14

How We Obtain Evidence

- **Consensus-Based:** Consensus may be largely influenced by group dynamics and the desire to perform like everyone else.
- **Expert-Based:** Might be even worse than consensus. It can have all kind of biases, like expert/opinion bias or financial motivation.
- **Evidence-Based**: Guideline recommendations are based on best available evidence, deals with specific interventions for specific populations and are based on a systematic approach.

Evidence-Based Practice (EBP)

- **Definition:** The conscientious, explicit, and unbiased use of current best research results in making decisions about the care of individual clients. Treatment decisions should be administered in practice only when there is a justified (evidence-based) expectation of benefit (Sackett et al, 1996). EBP is the integration of best research evidence along with clinical expertise and the client values.



- **Some Problems with EBP**: For research evidence, what if we don't have the empirical studies as evidence? For clinical expertise, what if clinicians have been things wrong all along? Often anecdotes are substituted for real evidence. For client values, just because a client/parent want a treatment, does that mean s/he should receive it?
- **Purpose of EBP:** (1) Promote the adoption of effective interventions; (2) Delay the adoption of unproved interventions; (3) Prevent the adoption of ineffective interventions.

- **From Harmful to Effective:** But what about the middle section? Should such practices be discard? How much evidence is enough? Is it implausible that you could get a great result from doing some-thing that currently lacks "definitive proof?"

- **Definitive Proof is Unscientific:** ♦Looking for proof is not what we should be doing. Because we don't *prove* concepts with research but simply move further away from what is incorrect. ♦Science looks for evidence, not proof. ♦Any theory that we currently accept as true is simply the one that has the best explanation and evidence-base, compared to any alternative idea. ♦We aren't talking about knowing the definitive answer to everything. What we are saying is that we base our practice and recommendations on theories that have better (and/or more) evidence than alternative theories with worse (and/or less) evidence.

7 Step Process for EBP (McLeod & Baker, 2016)

1. **Generate a PICO clinical question:** P = Patient; I = Intervention; C = Comparison; O = Outcome
2. **Find external evidence relevant to the question:** Now you need to answer your PICO question by searching the external research evidence. Try to locate systematic reviews if possible. ♦Use ASHA Journal Search function; ♦ASHA Practice Portals; ♦ASHA Evidence Maps; ♦Google Scholar; ♦MEDLINE; ♦AHRQ's National Guideline Clearinghouse; ♦IES What Works Clearinghouse; ♦MUSEC Briefs; ♦Talking EBP website.
3. **Critically evaluate the external evidence:**
   - **Levels of evidence from studies**: LEVEL IV: WEAK value: Opinion of authorities, based on clinical experience; LEVEL III: LIMITED value: Nonexperimental studies (i.e., correlational and case studies); LEVEL IIb: MODERATE value: Well-designed quasi-experimental study; LEVEL IIa MODERATE value: Well-designed controlled study without randomization; LEVEL Ib: STRONG value: Well-designed randomized controlled study; LEVEL Ia: STRONGEST value: Well-designed meta-analysis of >1 RCT.
4. **Evaluate internal evidence from your clinical practice.** Also known as "Practice-Based Evidence".
5. **Evaluate the internal evidence with respect to the client and family factors, values, and preferences:** These include child/family factors and values known or believed to influence intervention outcomes and the need to have fully informed children and their families so they can appropriately select their preferences.
6. **Make a decision by integrating the evidence:** There is no single gold-standard decision-making flow chart to guide us to a perfect decision with every client, every time. Must take into account clinical expertise *"…defined not only by technical, procedural, and knowledge-based (intellectual) qualities, but by interpersonal and attitudinal qualities as well"* (Kamhi, 1994).
7. **Evaluate the outcomes of the decision:** Initially goals and a plan for evaluating progress need to be developed. Need to be able to problem solve things like slow or no progress, lack of carryover, etc. Reevaluate periodically. Reflect on client factors/values. Gather good clinical data.

10 Ways to Sell a Product Even When There's No Evidence That it Works

(Adapted from R. Shepherd, 2017)

1. **Boost your credentials:** Massage your credentials and state your connections to well-established professionals.
2. **Most of your staff don't need strong credentials either:** But throwing in a PhD friend can't hurt!
3. **Distract everyone with a good story:** Anecdotes and self-published works have the appearance of something real.
4. **Make it sound like rocket science:** Throw in big words and hard to understand concepts that sound scientific to misdirect people.
5. **Pretend that research is any document that contains charts and numbers:** Questionable data, usually from case studies, are displayed typically in a poster session and made to look like real research was conducted.
6. **Ignore negative results:** When evidence shows that it does not work, simply overlook it and keep telling stories.
7. **Blame the system:** Traditional and conventional procedures are regarded as ineffective and make it appear that there is a conspiracy by the "establishment" to thwart new procedures.
8. **Be as inclusive as possible:** Make the treatment "work" for a myriad of unrelated problems.
9. **Make your customers into advocates:** Make your admirers into disciples to inspire others to join in the endeavor.
10. **Make it pretty:** Attractive packaging of the product and a website that looks scientific will produce more sales of the product.

Tools for Skeptical Thinking—Baloney Detection (Sagan, 1996)

These ideas can help you remain appropriately skeptical when encountering new therapeutic techniques so you can test and analyze the purported findings.

- **Independent confirmation:** Can other clinicians/researchers come up with the same findings?
- **Encourage debate on the evidence:** There must be open and free dialogue in order for the science of new techniques to be evaluated.
- **Believe data not "experts":** Don't let testimonials and non-scientific findings sway you…these may be interesting and may lead us to ask important questions, but arguments from authorities without proper data should be meaningless.
- **Spin more than one hypothesis:** If there are no conceivable reasons for something to work, then it must be questioned if it really does work.
- **Don't overly attach to a hypothesis:** Believe the research, not the emotions of yourself and others, especially parents.
- **Quantify the findings:** Testimonials cannot be used. We must quantify the results of the techniques and interpret the findings accurately and fairly.
- **Every link in the argument chain must work:** When following the logic of the argument ALL of the pieces must fit together, not just some.
- **Count the HITS and the MISSES:** We cannot overlook the misses and only concentrate on the hits.
- **A case study is not experimental:** A case study cannot and never has been a methodology for explaining cause-effect relationships.
- **If it is too good to be true, it probably is NOT true:** We cannot let our "excitement" dictate over our thinking of the issues.

- **Follow the scientific methodology.**
- **Be wary of information from the popular press:** Only information from peer-reviewed reputable journals can be believed, and then appropriate skepticism must still be applied.

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- **Dangerous Quackery in the News:** http://www.theguardian.pe.ca/news/local/2016/6/30/p-e-i-family-devastated-after-unproven-4575562.html
- **Distinguish Real from Fake Science**: http://www.forbes.com/sites/emilywillingham/2012/11/08/10-questions-to-distinguish-real-from-fake-science/#7f805de5533b
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- **Ice Baths:** http://news.bbc.co.uk/2/hi/health/183660.stm
- **IES What Works Clearinghouse:** http://ies.ed.gov/ncee/wwc
- **Implementation Science:** H*ttp://www.ucdenver.edu/academics/colleges/medicalschool/programs/crisp/about/Pages/About-Dissemination-and-Implementation-Science.aspx*
- **Lof Science/Pseudoscience Checklist:** http://www.smartspeechtherapy.com/wp-content/uploads/2015/07/LOF-Science-v-Pseudo-ASHA12.pdf
- **Markers of Good Science:** https://sigmanutrition.com/drawing-a-line-in-the-evidence-based-sand/
- **MUSEC Briefings:** (Google this)
- **Practice-Based Evidence:** http://www.astdd.org/docs/LarryGreenPresentationSelectedSlides.pdf
- **Quackwatch:** www.quackwatch.org
- **Skeptics:** www.skeptic.com
- **Speech Pill:** http://www.speechnutrients.com/products/speak/
- **Talking EBP in Schools:** http://people.virginia.edu/~lmh3f/TalkingEBP/
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A ROUGH GUIDE TO SPOTTING

BAD SCIENCE

1. Sensationalized Headlines

Headlines of articles are commonly designed to entice viewers into clicking on and reading the article. At best, they over-simplify the findings of research. At worst, they sensationalized and misrepresent them.

2. Misinterpreted Results

News articles sometimes distort or misinterpret the findings of research for the sake of a good story, intentionally or otherwise. If possible, try to read the original research rather than relying on the article based on it for information.

3. Conflicts of Interests

Many companies employ scientists to carry out and publish research; while this does not necessarily invalidate research, it should be analyzed with this in mind. Research can also be misinterpreted by personal for financial gain.

4. Correlation & Causation

Be wary of confusion of correlations and causation. Correlation between two variables doesn't automatically mean one causes the other. This is a very common mistake made by people who don't fully understand statistical analysis.

5. Speculative Language

Speculations from research are just that—speculations. Be on the look out for words such as "may, "could," "might," and others, as it is unlikely the research provides hard evidence for any conclusions they proceed.

6. Sample Size Too Small

In trials, the smaller the sample size, the lower the confidence in the results from that sample. Conclusions drawn should be considered with this in mind, though in some cases small samples are unavoidable. It may be cause for suspicion if a larger sample was possible but avoided.

7. Unrepresentative Samples

In human trials, researches will try to select individuals that are representative of a larger population. If the sample is different from the population as a whole, then the conclusions may well also be different.

8. No Control Group Used

In clinical trials, results from test subjects should be compared to a control group not given the substance being tested. Groups should also be allocated randomly. A control test should be used where all variables are controlled.

9. No Blind Testing Used

To prevent any bias, subjects should not know if they are in the test or in the control group. In double-blind tests, even researchers don't know which group subjects are in until after testing. Blind testing isn't always feasible or ethical.

10. "Cherry-Picked" Results

This involves selecting data from experiments which supports the conclusion of the research, while ignoring those that do not. If a research paper draws conclusions from only a selection of its results, but not all of it, this may be cherry picking.

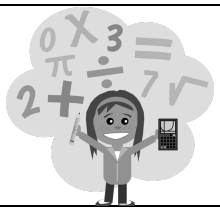
11. Unreplicable Results

Results should be replicated by independent research, and tested over a wide range of conditions (where possible) to ensure they are generalizable. Extraordinary claims require extraordinary evidence; that is, much more than one independent study.

12. Journals & Citations

Research published by major journals will have undergone a review process, but can still be flawed. Similarly, large numbers of citations do not always indicate that research is highly regarded.

Markers of
GOOD SCIENCE



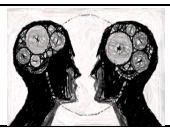
It makes claims that can be tested and verified.

It has been published in a peer reviewed journal. But be aware, there are some dodgy journals out there that seem credible, are not.

It is based on theories that are discussed and argued for by many experts in the field.

It is backed up by experiments that have generated enough data to convince other expects of its legitimacy.

Its proponents are secure enough to accept areas of doubt and need for further investigations.



It does not fly in the face of the broad existing body of scientific knowledge.

The authors have a bona fide high level of scientific qualifications.

https://sigmanutrition.com/drawing-a-line-in-the-evidence-based-sand/

Science vs. Pseudoscience in CSD: A Checklist for Skeptical Thinking

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MGH INSTITUTE OF HEALTH PROFESSIONS
A graduate school founded by Massachusetts General Hospital

A poster presentation at the
2012 ASHA Convention, Atlanta Georgia

There are many questionable alternative treatment approaches that are heavily marketed and promoted but have no evidence to support their use. Even experienced clinicians frequently resort to these fad or alternative treatments…in other words, they "get quacked" into using them. Quackery is a type of pseudoscience because it is a practice or remedy that has no compelling scientific basis; it includes questionable ideas, products and services. Clinicians may get quacked because they are not being appropriately skeptical or they do not have the tools to help distinguish between science and pseudoscience. Below is a checklist that can help clinicians evaluate claims made by promoters of products or services to help determine if they are based on scientific principles or on pseudoscience.

Healthy Debate About the Therapy	
The debates and discussions are About efficacy findings/data	The debates usually are not about data, but instead about beliefs and opinions
❒ **Science**	❒ **Pseudoscience**

Quantifiable Data are Used	
Data are quantitative, gathered following the scientific method	Data are qualitative, based on expert opinion
❒ **Science**	❒ **Pseudoscience**
Higher level studies tested the procedure	Data are testimonials and case studies
❒ **Science**	❒ **Pseudoscience**

Valid Data are Disseminated	
Information is presented at conferences that use peer-review and scientific standards	Information is presented at CEU events and other non peer-reviewed conferences
❒ **Science**	❒ **Pseudoscience**
Information and data are presented in reputable journals	Information appears in self-published books or in the popular press
❒ **Science**	❒ **Pseudoscience**
Information is found on trustworthy, professional websites	Information is on proprietary, self-developed websites
❒ **Science**	❒ **Pseudoscience**
Valid and reliable data are presented in prominent spots on the webpage	Websites reporting findings have a testimonial section for hearsay but no research section
❒ **Science**	❒ **Pseudoscience**

Information is Peer-Reviewed	
Anonymous (blinded), impartial refereeing of data/findings	No peer review or only quasi/pseudo peer review of the findings
❒ **Science**	❒ **Pseudoscience**

Independent Confirmation of Findings	
Independent because the researchers are not connected to the therapy	No independent confirmation by impartial reviewers
❒ **Science**	❒ **Pseudoscience**

Scientific Method is Followed	
Data obtained follow the scientific method to determine effectiveness	Use only clinician experience and judgments as the "best way" to determine effectiveness
❒ **Science**	❒ **Pseudoscience**
Data are gathered by professionals who are qualified to study clinical questions	Implicit disdain for researchers because of the belief that "only clinicians really understand clinical work"
❒ **Science**	❒ **Pseudoscience**

Results Have Theoretical Explanations	
Theoretical models explain why therapy works	Poorly defined theoretical models for explanation of why a procedure is effective
❒ **Science**	❒ **Pseudoscience**
Every link in the chain of explanation is connected	Gaps and missing information break the chain of plausibility
❒ **Science**	❒ **Pseudoscience**

Use of Historical Data	
Appropriate reporting of prior data relevant to the therapy	Claims of effectiveness because it has been done a long time in the field (e.g., "Van Riper said…")
❒ **Science**	❒ **Pseudoscience**
Correct referencing of historical researchers and their findings	Claims of effectiveness only because of extensive clinical experience of clinician
❒ **Science**	❒ **Pseudoscience**
Unbiased and honest reporting of the pros and cons of a procedure	Claims of effectiveness because of promoter's authority or charismatic nature
❒ **Science**	❒ **Pseudoscience**
Appropriate use of data and theories from multiple perspectives	Only use information from outside the field because "other fields know better"
❒ **Science**	❒ **Pseudoscience**

Results are "Too Good to be True"	
Findings are specific for when and with whom a procedure may work	Claims of effectiveness for a wide range of clients with unrelated problems
❒ **Science**	❒ **Pseudoscience**
Objective terms about effectiveness for specific populations are stated	Claims appeal to fears or wishful thinking about effectiveness or cure
❒ **Science**	❒ **Pseudoscience**
Well-defined target population	Treatment often focused on desperate clients (e.g., highly involved, severely impaired, difficult to teach, etc.)
❒ **Science**	❒ **Pseudoscience**
Non-subjective terms describe effectiveness	Use hyperbole such as: "results in minutes," "miracle cure," "problem solved"
❒ **Science**	❒ **Pseudoscience**

Both Misses and Hits are Counted	
Candid about when a procedure is and is not effective	Data ignored when a procedure does not work but referred to when it does work
❒ **Science**	❒ **Pseudoscience**
Disproving evidence is not ignored	Practice remains unchanged even with disproving evidence
❒ **Science**	❒ **Pseudoscience**

Terms and Concepts are Standard and Conventional	
Use of terms that are agreed upon by the scholarly community	New terms are created that are neither scientific nor conventional ("pseudoscientific jargon")
❒ **Science**	❒ **Pseudoscience**

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Disclosure Statement

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20 Cognitive Biases That Screw Up Your Decisions

1. Anchoring bias.

People are **over-reliant** on the first piece of information they hear. In a salary negotiation, whoever makes the first offer establishes a range of reasonable possibilities in each person's mind.

2. Availability heuristic.

People **overestimate the importance** of information that is available to them. A person might argue that smoking is not unhealthy because they know someone who lived to 100 and smoked three packs a day.

3. Bandwagon effect.

The probability of one person adopting a belief increases based on the number of people who hold that belief. This is a powerful form of **groupthink** and is reason why meetings are often unproductive.

4. Blind-spot bias.

Failing to recognize your own cognitive biases is a bias in itself. People notice cognitive and motivational biases much more in others than in themselves.

5. Choice-supportive bias.

When you choose something, you tend to feel positive about it, even if that **choice has flaws**. Like how you think your dog is awesome — even if it bites people every once in a while.

6. Clustering illusion.

This is the tendency to **see patterns in random events**. It is key to various gambling fallacies, like the idea that red is more or less likely to turn up on a roulette table after a string of reds.

7. Confirmation bias.

We tend to listen only to information that confirms our **preconceptions** — one of the many reasons it's so hard to have an intelligent conversation about climate change.

8. Conservatism bias.

Where people favor prior evidence over new evidence or information that has emerged. People were **slow to accept** that the Earth was round because they maintained their earlier understanding that the planet was flat.

9. Information bias.

The tendency to **seek information when it does not affect action**. More information is not always better. With less information, people can often make more accurate predictions.

10. Ostrich effect.

The decision to **ignore dangerous or negative information** by "burying" one's head in the sand, like an ostrich. Research suggests that investors check the value of their holdings significantly less often during bad markets.

11. Outcome bias.

Judging a decision based on the **outcome** — rather than how exactly the decision was made in the moment. Just because you won a lot in Vegas doesn't mean gambling your money was a smart decision.

12. Overconfidence.

Some of us are **too confident about our abilities**, and this causes us to take greater risks in our daily lives. Experts are more prone to this bias than laypeople, since they are more convinced that they are right.

13. Placebo effect.

When **simply believing** that something will have a certain effect on you causes it to have that effect. In medicine, people given fake pills often experience the same physiological effects as people given the real thing.

14. Pro-innovation bias.

When a proponent of an innovation tends to **overvalue its usefulness** and undervalue its limitations. Sound familiar, Silicon Valley?

15. Recency.

The tendency to weigh the **latest information** more heavily than older data. Investors often think the market will always look the way it looks today and make unwise decisions.

16. Salience.

Our tendency to focus on the **most easily recognizable features** of a person or concept. When you think about dying, you might worry about being mauled by a lion, as opposed to what is statistically more likely, like dying in a car accident.

17. Selective perception.

Allowing our expectations to **influence how we perceive** the world. An experiment involving a football game between students from two universities showed that one team saw the opposing team commit more infractions.

18. Stereotyping.

Expecting a group or person to have certain qualities without having real information about the person. It allows us to quickly identify strangers as friends or enemies, but people tend to **overuse and abuse** it.

19. Survivorship bias.

An error that comes from focusing only on surviving examples, causing us to **misjudge a situation**. For instance, we might think that being an entrepreneur is easy because we haven't heard of all those who failed.

20. Zero-risk bias.

Sociologists have found that **we love certainty** — even if it's counterproductive. Eliminating risk entirely means there is no chance of harm being caused.

http://www.businessinsider.com/cognitive-biases-that-affect-decisions-2015-8

Common Flaws in Thinking (Travers, 2016)

"Thinking Error"	Brief Definition	Example	Problem
Confirmation Bias	Selecting and conforming to evidence to maintain cherished beliefs.	*"I found a case study in an online-journal that supports me using this therapy, so I'm using evidence and am going to keep using the therapy."*	Purposely or implicitly ignores contradictory evidence and promotes positive evidence; disregards how personal investment influences perceived outcome; ignores placebo effect.
Appeal to Faith	Intervention effectiveness depends on belief that it works.	*"Facilitated communication cannot be empirically tested because skeptical examination compromises its effects."*	Requires acceptance of a claim in the absence of evidence; intervention is only effective when the person believes it will be.
Argument from Ignorance	Absence of evidence that an intervention doesn't work is deemed reason to believe it is effective.	*"There is no proof that this intervention won't work, so it's worth trying."*	Absence of data against an intervention is not a valid reason to believe it may or will be effective.
Anecdotal Evidence	Personal experience is treated as reason to believe a claim.	*"It worked for my student with ADHD. I've seen it work so it must work. So it should work for Tom."*	Anecdotes may or may not be true, but are never representative. Anecdotes are the lowest form of evidence and are extremely unreliable and can be dangerous.
Correlation Fallacy	Belief that because something occurred after an event, the event must have caused it.	*"My child got vaccinated and now he has autism. Therefore, the vaccines must have caused his autism"*	Coincidences are common in a world filled with countless random and non-random events. Just because something followed an event doesn't mean the preceding event caused it.
Shifting the Burden of Proof	Requiring the skeptic to refute a claim that already lacks sufficient evidence.	*"Can you prove to me that this student won't benefit from sensor-integration treatments?"*	The claimant bears the burden of proof, but instead expects doubters to provide proof against his/her unsupported claim/position.
Appeal to Authority	Status of the claimant is used to support the claim.	*"Professor Poe who does a lot of presentations says this intervention works, so I should use it."*	Belief in the claim stems from the status of the person making it rather than from evidence.
False Authority	The purported expertise of the claimant is used to make or defend claims.	*"Only specially certified trainees can comment of the efficacy of Rapid Prompting Method; they are the only ones in-the-know.'*	Props up claims or deflects criticism by discounting arguments from individuals who do not have the dubious credential.
Argument to Moderation	Asserting the truth is somewhere between two claims despite the amount or quality of evidence.	*"Many people say some phonics is the best way to teach reading, but others argue for whole language. We should use a little bit of both."*	Position with less/no evidence and position with most/all evidence are treated as extremes; concludes truth reside between two polar positions when one is actually more likely to be true.
Ad Hominem	Attacking the claimant's character rather than the evidence for the claim.	*"The researcher is in his ivory tower and doesn't care about kids like I do. He cannot be trusted."*	Ignores the argument and evidence for the effectiveness of the intervention and instead focuses on attacking a person.