**TERMINOLOGY CHEAT SHEET**

*For full instructions on evaluating research claims, please refer to the article located at* [*http://www.theptdc.com/2014/06/analyze-fitness-research/*](http://www.theptdc.com/2014/06/analyze-fitness-research/)

**Evidence:** Facts or information indicating that a statement, belief or position is either true or valid. Evidence comes in many forms, such as personal anecdotes or systematic research studies; however, not all evidence is equal and a person’s opinion is much less reliable than is a competently performed research study.

**Cherry-picking:** Selectively choosing examples or items from the total available, either to support your preferred position or to refute an opponent’s position. If I support an argument only with evidence that helps my position while ignoring quality evidence that contradicts that argument, I have cherry-picked. Arguments should be determined on the total available evidence and the quality of that evidence, not because some information was purposely left out in order to win a debate.

**Population:** A well-defined collection of individuals or groups known to have similar characteristics. In research, a population is the total number of individuals or items that possess a trait that the researchers are interested in, in which the study sample – the participants – are meant to represent. When reading an argument or research paper, it is very important to have a firm understanding of which population – whether it’s based on age, ethnicity, gender, activity level, the presence or risk of a disease or injury, or any other potential variable or combination of variables – that is being studied or otherwise commented on. If the paper’s population is not the same as your population of interest, the findings may not specifically be valuable to you (unless the differences have been shown not to impact those outcomes).

**Bias:** A tendency to believe that some people, ideas, etc., are better than others that usually results in treating some people unfairly.Bias is the sum of our emotions, experiences, beliefs and intuitions; It influences our decision-making by causing us to prefer some explanations or ideas over others before we openly consider new information. The universal occurrence of bias is one of the most important reasons that personal experience can offer only limited and incomplete evidence for a belief or argument and should always be viewed with skepticism without more powerful, less-biased sources of information, such as carefully constructed research studies.

**Prove (proof):** To demonstrate the truth or existence of something by evidence. In reality, “proving” any argument, scientifically or otherwise, is extraordinarily difficult and philosophically impossible: rather than attempting to “prove” an argument, researchers conduct experiments and make observations that will either show evidence for or against an idea or concept. At some point, there will be enough quality evidence for or against an argument to decide if it is reasonable to consider the matter *much more than likely* true or not true, but never technically “proven.”

**Hypothesis:** A proposed explanation based on limited evidence, a scientifically plausible explanation for a phenomenon. The hypothesis is then tested repeatedly to find evidence that either supports or denies the idea. In common language, people mistakenly use the term “theory” when they really mean “hypothesis;” in fact, a theory is a well-substantiated and highly evidenced hypothesis or group of hypotheses, often validated over many years of hundreds of scientific trials and evidence supporting it.

**Falsification:** The act of showing that a hypothesis or theory is incorrect with conflicting, validated evidence. The statement “all swans are white” is immediately falsified by the observation (and technically, the validation of that observation) of a single black swan. Thinking critically and the scientific method both demand that one constantly searches for falsification evidence to their own beliefs or hypotheses. The absence of falsification evidence does not “prove” that an idea is true, but allows that idea to remain a plausible explanation for an observed phenomenon.

**Confounding Variables:** An aspect of a system that in turn affects other aspects of that system yet remains unaccounted for. For example, it is a true association that drowning deaths increase along with the number of ice cream sales. While we could try to reason that people eating ice cream might be heavier and sink, or that eating ice cream causes cramps when swimming, causing people to drown, neither explanation takes into account that in warmer temperatures, more people eat ice cream as a cold treat, and they also swim more to cool off. If you were to accept either of the precious explanations, then increased temperature would be the confounding variable in those explanations, an unaccounted detail that reveals the true association. Personal anecdotes or observations without controls, such as those found in well-designed research studies, are often incapable of observing and accounting for all potential confounding variables, making them far more unlikely to accurately explain and evidence a cause and effect relationship between events.

**Strawman:** a logical fallacy where an argument is misrepresented in order to more easily defeat that argument. Most often, a strawman is constructed by changing or emitting any number of key points in the original argument in order to more easily refute it with evidence or counter-argument that would not have otherwise applied.

 **Systematic Review:** A high-level overview of the primary research examining a particular topic. Systematic Reviews can give us insight into the total body of knowledge through specifically outlined selection criteria and appraisal of identified articles. For this reason, a well-performed Systematic Review should be considered as persuasive evidence in any given topic.

**Meta-Analysis:** A statistical analysis of the data collected through a Systematic Review. A Meta-Analysis is, in essence, one large research paper which is based on the data collected from the best available research on a specific topic collected and analyzed during the systematic review process. All Meta-Analyses should be based on a Systematic Review, but not all Systematic Reviews will be a Meta-Analysis, which requires additional statistical work beyond the Systematic Review process.

**Sample:** A selected group of individuals or items from a larger population that is meant to represent specific characteristics of that population for the purpose of investigation and research. For example, if I was interested in researching the effects of a training program on professional baseball players, I could select two players from each team in MLB, or I could limit my population of interest to just first basemen and randomly select 15 first basemen from the 30 possible teams. Each subject would become a member of my study sample, with the expectation that with a random selection of players, the average performance of my testing will be applicable to all members of their population (recognize that the population of interest here is not “professional athletes” but “professional baseball players.” While a professional baseball player is also a professional athlete, because the total population of professional athletes would include a wide variety of different body types, sport-specific strengths and skills, heights, weights, etc, a study claiming to evaluate characteristics of professional athletes but only using a sample of professional baseball players might not actually be applicable to the larger population of *all professional athletes*).

**Convenience Sample:** Obtaining a study’s subjects through what’s most readily available or easily acquired. Using the example in this article, even though the authors of the paper claimed to be reporting on the abdominal strength and posture of all humans (or, at least, all North Americans), the sample itself can’t be used to inform us about any population other than physical therapy students, predominantly female, between the ages of 20-33 located in Virginia and their performance on a specific test that has yet to be validated for the purpose of general abdominal strength.

If this is the only investigation into this subject, we can cautiously take some information concerning the plausibility of the hypothesis (i.e., that pelvic position may not greatly influence abdominal strength), but we can’t say anything more definitive than this, certainly not with any degree of certainty or confidence, due to the design of the experiment as well as the convenience sampling performed which limited the applicability of these findings.

**Retrospective (Case-Control) study:** A study design that looks back at specific events that occurred in the past in order to evaluate possible influencing factors on a particular item of interest, such as a disease or measure of performance. A case-control study will compare this data with individuals (the controls) that do not present with the item or quality of interest but who otherwise appear equivalent (such as medical doctors who smoke vs. medical doctors that do not smoke in an investigation of lung cancer). This type of study is most effective when looking at rare events, such as a rare form of a disease, where there may be few possible subjects to investigate; however, they are subject to a high risk of bias (the factors that a researcher believes are important in selecting controls are subject to that investigators beliefs concerning what qualities are and are not important), as well as the issues of accurate subject recollections of key events and exposures, among others.