HOW TO READ A SCIENTIFIC STUDY

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Marketing claims backed with so-called scientific evidence pervade the health and fitness industry. Supplement manufacturers sell compounds like raspberry ketones as if the evidence for their effects is as strong (or stronger than) creatine. Sometimes, following the paper trail of a marketing claim leads to a real, published study. Unfortunately, not all studies are created equal. Determining the credibility of a study is vital for navigating the vast world of health and fitness marketing without wasting money.

Understanding a study as a whole, as well as how it relates to previous research on the topic, comes from reading more than just the abstract. Context is very important when discussing new research, which is why abstracts that promise too-good-to-be-true results are often misleading.

Understanding the Abstract and Introduction

The abstract is a brief summary that covers the main points of a study. Sometimes the abstract can be misleading, since there's a lot of information to pack into a few paragraphs. The abstract does not provide context, which means it's not very helpful for understanding the mechanisms and applicability behind a topic. Before citing a study as evidence in a discussion, make sure to read the whole thing, because it might turn out to be weak evidence.

The introduction sets the stage. The authors of the study usually summarize previous research on their topic and explain why they chose to investigate it. For example, the compound HMB was found to improve bone mineral and skeletal muscle density when supplemented by elderly people, so researchers set out to determine how to make it work for younger people. Introductions are also a great place to find additional reading material, since study authors will frequently reference other relevant, published studies on the topic.

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The Most Important Part of the Study: Methodology

Reading and understanding the methodology section of a study is vital for determining if it provides strong or weak evidence. This section contains demographic information like age, sex, and lifestyles of the participants, how they were recruited, and details about the intervention itself. Ideally, the methodology discussion is so detailed that other researchers can repeat the study without needing to contact the authors of the paper.

The demographic information can be lengthy and tempting to skip, but it's as important as the rest of the methodology section because it determines whom the results of the study are applicable to. For example, if a study only recruits women for a supplement trial, men reading the study should keep in mind that the results may not apply to them directly. Applicability is very important, especially in health and fitness, since a compound that is useful for one person may be a waste of money, or worse, harmful, when supplemented by someone else.

There are several aspects of the methodology to pay attention to in particular. The larger the sample size in a study, the more reliable the results are. The way the researchers recruited their participants is also important, since their method may be more likely to find certain demographics, which could influence the outcome of the study.

The actual design of the trial is another important piece of the methodology section. The gold standard for a scientific study is a double-blind placebo controlled study, which means both the researchers administering the trial and the participants don't know whether they're receiving a placebo or the tested compound. Other study variants include a single blind trial, in which only the participants don't know if they're receiving placebo, as well as an observational trial, in which researchers observe a population and take measurements. Keep in mind that an observational trial cannot show causation, since the scientists conducting the study are not controlling any variables.

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Interpreting Statistics and P-values

The methodology section usually concludes with a hearty statistics discussion. Determining whether an appropriate statistical analysis was used is an entire field of study, so when reading statistics, try to focus on the big picture.

Researchers run a statistical analysis on their results to determine if they are significant. A p-value, which stands for probability value, tells you how likely it is that the study result would happen if the null hypothesis was true (the null hypothesis is usually along the lines of "XYZ supplement/intervention DOESN'T work when compared to a control group"). A p-value of 0.0482 means there is a 4.8% chance the results are compatible with the null hypothesis, while a 0.000001 value means there's only a one in a million chance, both of which are statistically significant results.

A result can be statistically significant and clinically insignificant at the same time. For example, if researchers find that supplementing a compound daily helps people burn an extra pound of fat every year with a p-value of 0.0003, that compound probably isn't worth supplementing but still exhibits a reliable, weak effect.

P-values aren't the final say on significance, however. P-values can be influenced by confounding variables, since the statistical analysis only accounts for the variables the researchers were controlling. When evaluating the strength of a study's design, imagine yourself in the researcher's shoes and consider what flaws a study might have outside of what was written down in the paper.

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Reading the Results

It's tempting to skip right to the results section after reading the abstract, but that leads to misinterpretation and the spread of misinformation. Never read the results without reading the methodology section first. Knowing how researchers arrived at a conclusion is as important as the conclusion itself. Researchers discuss the primary outcome, or what they were most interested in investigating, in the results section.

One of the first things to look for in the results discussion is a comparison of characteristics between the tested groups. Big differences in baseline characteristics after randomization may mean the two groups are not comparable.

Researchers will also report on dropout and compliance rates. Life frequently gets in the way of science, so almost every study has participants that don't finish the trial or don't follow the instructions. A lot of dropouts or non-compliant participants should raise red flags though, especially if one group of participants was more prone to dropping out.

Scientists use questionnaires, blood panels, and other methods of gathering data, all of which is displayed in the results section through charts, graphs, and figures.

The results could also include a secondary analysis, such as looking specifically at the results for a subgroup (like women only, or only those participants over age 65) or doing a sensitivity analysis (which sees if the results stay the same when some of the data is not included). Subgroup analyses can be interesting, but very rarely is a trial large enough that looking at a specific group is statically powerful enough to make strong conclusions. Sensitivity analysis can be extremely important for studies that include suspect data, as the analysis can give you greater confidence that the results aren't due to faulty data.

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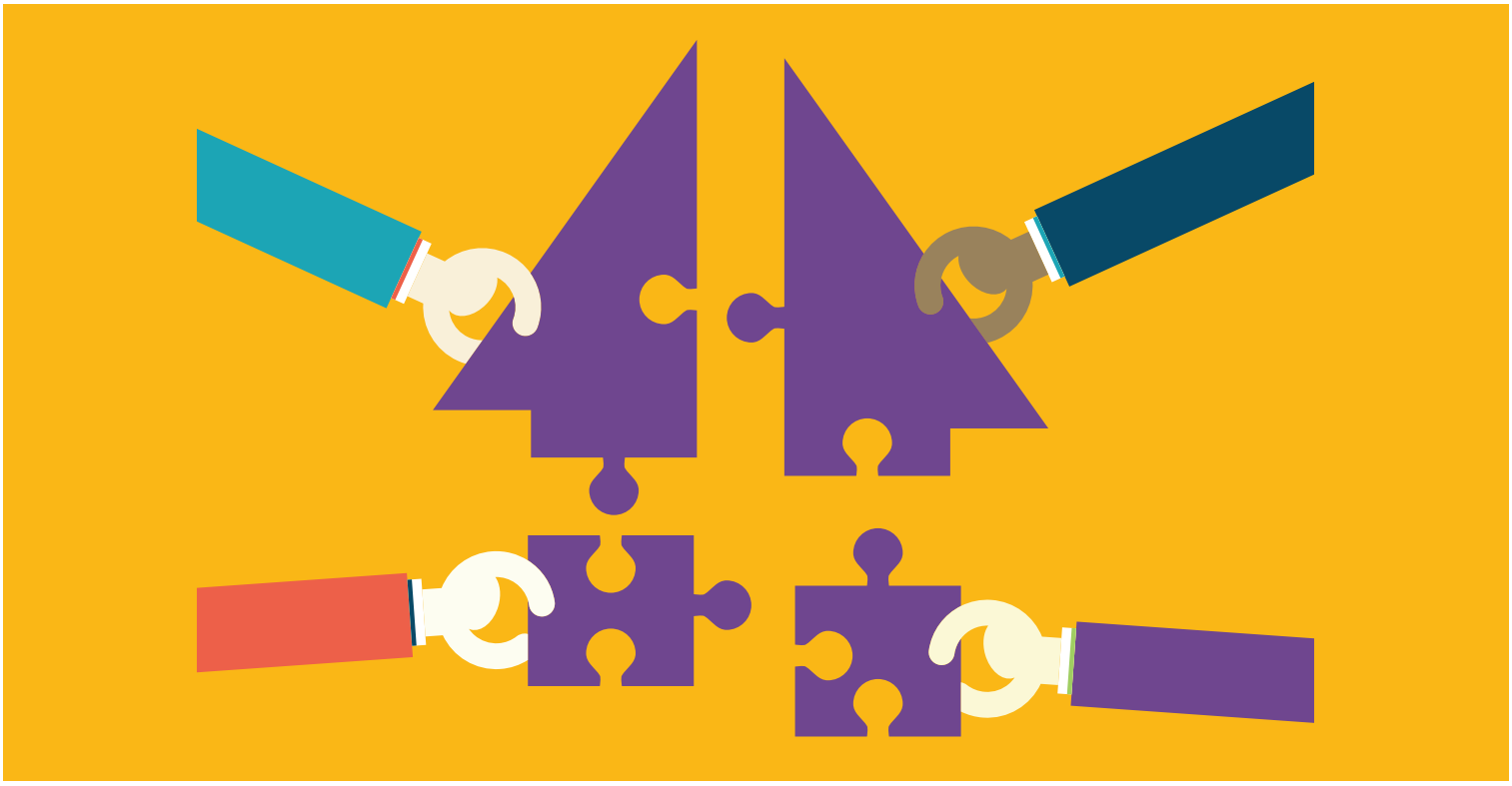
Clarifying the Conclusion



The conclusion wraps up the study and allows the researchers to discuss the importance of their work and other studies that have found similar results. Sometimes, the authors will take the opportunity to clarify their interpretation of the study's results, as well as compare it to previous studies on the topic.

The conclusion is also an appropriate section to discuss potential future studies based on the new results. That being said, researchers also might hypothesize a potential mechanism of action, or point out ways future studies could improve on their own design. If there are any conflicts of interest, they are sometimes disclosed after the conclusion.

Like the introduction, the conclusion provides valuable context and insight from the authors of the paper. If it sounds like the researchers are extrapolating to populations beyond the scope of the study, or are overstating their results, don't be afraid to read the study again (especially the methodology section)!

But we're not done yet....

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Digging Down to the Truth

Just because a study is published doesn't mean the results apply to everyone. Some researchers intentionally select demographics and interventions in a way to maximize the effects of their intervention. For example, the first studies on glutamine were conducted on burn victims, who are deficient in glutamine due to their injury. This is frequently done by hospital researchers who are looking for a way to help a specific kind of patient. People who are not deficient in glutamine would not experience the same benefits as burn victims.

This strategy is also popular in weight loss trials, which is why new supplement products marketed for weight loss are sometimes supported by studies that only recruit obese postmenopausal women. When this kind of information is left out of the abstract and journalists don't read the methodology section, people end up misled.

Never assume the media has read the entire study. Overworked journalists frequently rely on skimming to meet deadlines, so there is no substitute for reading the study yourself. When in doubt, *always* re-read the methodology section.

FOUND THIS USEFUL? DON'T FORGET TO SPREAD THE WORD TO YOUR FRIENDS!

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