Drug Policy Alliance
Primer on Reading Research

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We are the Drug Policy Alliance.

Why a Primer on How to Read/Evaluate Research?

Policy debates are increasingly debates over research and science, with more and more stakeholders laying claim to evidence-based policies, thus making it imperative for policy reformers to be knowledgeable about the use of research. Given the proliferation of questionable, 'junk' science and predatory, pseudoscience journals, it has become even more difficult to discern high-quality science from bad science. Moreover, due to the highly politicized nature of drug policy reform, we need to be sharp about our use of research and above reproach when advocating for particular policies. Hence, this primer is meant to guide your reading and evaluating of research**.**

What is An Academic Research Article?

A **peer-reviewed academic research article** contains in-depth research on a specific question (or set of questions) or specialized, technical topics. Its purpose is to provide information about original research or experiments and to report new findings in a field of research. Academic research articles generally include an abstract followed by these sections titled: Introduction, Methods, Results/Findings and Discussion/Conclusion. Some journals have additional files (called Supplementary Online Information) which contain important details of the research, but are published online instead of in the article itself.

How to Search for or Identify Peer Reviewed articles:

A peer-reviewed (or sometimes, "refereed") article is one that has been reviewed and critiqued before a panel of experts to assure that the quality of research is sound, before it is published in a journal. An article is peer-reviewed if it comes from a peer-reviewed journal, and not all journals are peer-reviewed.

- You can find out if a journal is peer-reviewed by Google-searching the journal title and looking at an overview or key facts about the journal.
- Many databases provide a box that you can check to search for peer-reviewed articles, so when searching for articles, be sure to check the pertinent box to limit your search results accordingly. In some databases, you may have to go to an "advanced" search screen to do this.

Spotting Bad/ Not-so-good Science

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 sensationalize and misrepresent them.

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 media article describing it. This may be as easy as clicking a link in the article, or you may have to do some searching. PubMed (http://www.ncbi.nlm.nih.gov/pubmed), Google Scholar (https://scholar.google.com/), and Science Direct (http://www.sciencedirect.com/) are all great databases to find articles. Searching by the author's name and some keywords from the study usually works best. Not all articles are open-access, but you can usually get some meaningful information from the abstract summary you can read before hitting the paywall. And you can always reach out to OAE or the Communications Research Coordinator for help obtaining the full article.

Sample size too small. In trials, the smaller a 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 large sample was possible but avoided.

Selection Bias/ Unrepresentative samples. In human trials, researchers 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.

- Research on drug use is overwhelming subject to a selection bias since most samples are drawn from treatment settings, which means that only those who have a significant drug use problem and who have access to treatment are typically studied.
- Moreover, studies looking at treatment and other interventions often only look at "completers," excluding those who dropped out from the analysis, thereby falsely inflating the efficacy of the program. When evaluating a treatment study, be sure to find out if they included non-completers in their analysis.

No control group used. In clinical trials, results from test subjects should be compared to a 'control group' not being exposed to the treatment or intervention being tested. Groups should also be allocated randomly.

- Compared to other fields of study, there are also relatively few randomized controlled trials (RCT) in drug use research. RCT's are often not practical or ethical in treatment or criminal justice settings.

No blind testing done. To prevent any bias, subjects should not know if they are in the test or the control group. In double-blind testing, even researchers don't know which group subjects are in until after testing. Note, blind testing isn't always feasible, or ethical and is rarely used in in the field of drug policy.

Cherry-picked results/ Selective reporting of data. This involves selecting data from experiments which supports the conclusion of the research, whilst ignoring those that do not. If a research paper draws conclusions from a selection of its results, not all, it may be cherry-picking. This is why it is important to read the whole study and to pay special attention to the "limitations" section where sometimes cherry-picking is revealed.

Unreplicable results. Results should be replicable by independent research and tested over a wide range of conditions (where possible) to ensure they are generalizable. To find out if the results have been reproduced, search the paper's name on Google Scholar and click on the "Cited By" link beneath the name. This will list other researchers who mention the paper in their own publications, and may also give you a clearer view of how other researchers critiqued the paper.

Journals/citations. Research published in major, reputable journals will have undergone a peer review process. Papers not published in a peer-reviewed journal should not be trusted, so it is important to be on the lookout for poor-quality, predatory or pseudoscience journals.
Find out if the journal or its publisher is on this list of questionable, scholarly open-access publishers: https://scholarlyoa.com/publishers/. Or this list of questionable, scholarly open-access standalone journals: https://scholarlyoa.com/individual-journals/.

Another detail to look out for is a journal's impact factor, which measures the average number of times its papers are cited by other researchers. You can usually find this information on the journal's home page or by searching "impact factor" along with its name. Check out the impact factor of other journals in that field of research to see how they compare.

Correlation and causation. Correlation between two variables does not automatically mean one causes the other. For instance, correlation between marijuana use and the use of other drugs does not mean that marijuana causes use of other drugs because by the same logic, one could argue that coffee is a gateway to illicit drug use since most people who use illicit drugs also drink coffee.

Speculative language/unsupported conclusions. Speculations from research are just that - speculation. Be on the lookout for words such as 'may', 'could', 'might', and others, as it is unlikely the research provides hard evidence for any conclusions they precede.

Conflicts of Interests. Many companies and private interest groups employ scientists to carry out and publish research - whilst this does not necessarily invalidate research, it should be analyzed with this in mind. Research can also be misrepresented for personal or financial gain. Most reputable journals require authors to disclose conflicts of interest and report these before or after the article text, and all journals will list an author's affiliations. Sometimes it's helpful to google authors to find out more about them and their reputations.

Tips on getting the most out of an academic article:

"Research articles are not romance novels -- you don't read them from beginning to end."

Because scientific articles are different from other texts, like novels or newspaper stories, they should be read differently; not in a linear way (from beginning to end). Instead, it should be read strategically and with a critical mindset, questioning your understanding and the findings.

SKIM the article.

- *Get the 'big picture'* by reading the title, key words and abstract. This well tell you the major findings of the study and why they matter.
- Quickly scan the article, focusing on the *headings and subheadings*.
- Peruse the *figures and tables*, if available. Doing this will help you know what to look for when you actually read the article.
- *Read the conclusion*, which gives another overview of the content. This is where the article repeats its ideas, restates findings, and includes key takeaways on what was discovered, learned and what still needs to be researched.
- *Note any terms and parts you don't understand* for further reading. If you are unfamiliar with key concepts, look for them in the background/ literature review section. Some articles also have a brief list of key words.

RE-READ the various sections, but read smartly.

Introduction contains an overview of the paper and consolidates background information on the research topic. The Introduction will often cite many of the references.

Questions to guide your reading:

- What is the problem/purpose of the article? What problem is the study trying to solve?

Methods

Given the biases inherent in drug policy research, understanding/reading the Methods section is essential. Before accepting the study's findings, it is important to first get a sense of whether the research process upon which the findings are based on, is flawed.

Questions to guide your reading:

- What type of research study is it? (*See Glossary)*
- What is the strength of this type of research in the hierarchy of evidence? (*See Glossary)*
- What statistical methods were used for the analyses?

- What was the sample size of the population studied (n=?) Is it representative of the larger population? Note key traits like age, gender, location, timeframe of study
    - A large number of test subjects makes a study more robust and reduces the likelihood that the results are random. In general, the more questions a paper asks, the greater its sample size should be.
- Is there possible selection bias in the study's sample? *(See Spotting Bad/Not-So-Good Science)*
  Were there any tools, indexes or surveys used to measure or collect data? If so, is it a valid tool? Has it been tested for its strength?

Results/ Discussion presents data and numbers on the findings and explains if the hypothesis was proved/disproved and if there were any unexpected research findings.

Questions to guide your reading:

- What are the results/findings of the study? Were they statistically significant?
    - Statistical significance is denoted by the *p*-value, which measures the probability (*p*) that a study's results occurred by random chance. A *p*-value of 0.05 suggests the study's conclusions may be meaningful. Smaller *p*-values are better.
- What are the strengths/weaknesses of the study?
    - Look out for "Limitations" of the study, which can generally be found in the "Discussions" section. Limitations describe possible shortcomings of the experiment, including limitations of the data and/or research design.
- Is there other research related to this topic out there?
- When reading the discussion and results, look for key issues and new findings.
- Are the findings well-supported by evidence?
- Are the findings unique and supported by other works in the field?
- Is the study repeatable?
- What factors might affect the results?

Other Things to Note:

Publishing date. For many areas, current research is more relevant. Bear in mind that there is a definite lag period between when the research gets done, when the article gets written and when it gets published.

Author and journal credentials. Look through the authors to see if there is anyone whose name you recognize, whose work you know. This is an important process in trying to judge the quality of the data. Is the author reputable? Is the journal peer-reviewed?

Methodological Limitations and Disagreements in the Field of Drug Policy Research

- *Inherent biases in the type of research that gets funded*

The vast majority of the research money available goes to studies focused at the individual, not the policy, level. This emphasis on individual-level research largely restricts/limits funding for research examining the impact of other important factors influencing drug use, such as poverty, racism, and the social environment, as well as research on policy and structural interventions to address substance use and related problems.

- *Over-emphasis on outcomes that never escape an abstinence-only or prohibitionist framework*

The outcomes being studied often overemphasize the negative consequences of drug use on individuals rather than taking a broader view that examines the harms of current drug policies, such as criminalization and its collateral consequences as well as how prohibition can increase the danger of drugs, or the potential therapeutic benefits of certain substances, such as marijuana.

- *Lack of agreement over what constitutes "evidence-based" research*

Much of the research being done does not meet the standards for high-quality research, and unresolved in the field is what even qualifies as "evidence-based." For example, Wright and colleagues (2010) found that more than half of the "substance abuse" interventions targeting criminal justice programs that were designated as evidence-based by SAMHSA's National Registry of Evidence Based Programs and Practices had significant methodological problems, such as sample size or the program lacking an independent evaluator.

- *Challenges of rigorously evaluating efficacy of drug treatment*

Another typical problem with drug treatment studies is variability in the length of the evaluation and disagreement on what qualifies as treatment "success." In general, because the population can be difficult to follow, few studies evaluate people once they leave treatment.

GLOSSARY

Types of Scientific Studies

Generally, scientific studies often fall into two main categories: observational and experimental.

Observational studies involve scientists observing an event that's already occurring – for example, they may observe a group of subjects who have a particular disease, some of whom smoke marijuana for therapeutic relief, and some of whom don't. The researchers will not intervene in any way but simply gather results in order to describe or capture the effects of cannabis use on patients.
Examples: Case reports and case series, Cohort, Cross-sectional, Longitudinal, Field studies

Experimental studies involve scientists placing subjects into groups and carrying out experiments. In a typical randomized controlled trial, subjects are randomly placed into one of two groups; one group receives the treatment or intervention whilst the other, the control group, receives a placebo that appears identical.
Examples: Animal and cell studies, Randomized controlled trials

Types of Scientific Evidence Keep in mind that if a type of evidence is listed lower in the hierarchy, does not mean that it should be disregarded. In fact, some types of evidence can be precursors to the more conclusive types of evidence. For example, medical trials of potential drugs will usually commence with *animal or cell trials*, before then progressing to *randomized controlled trials*. When enough randomized controlled trials have been carried out, a *systematic review* of these trials becomes possible. Thus, the amassing of scientific evidence is an ongoing process, often involving several of the types of evidence shown here (ranked from least to most rigorous):

Anecdotal evidence/expert opinion. Anecdotal evidence is a person's own personal experience or view, which is not necessarily representative of typical experiences. An expert's stand-alone opinion, or that given in a written news article, are both considered weak forms of evidence without scientific studies to back them up.

Animal and cell studies. In terms of drug trials, animal research can be useful in predicting effects also seen in humans. However, animals may respond differently than humans, so observed effects can also differ. Tests on isolated cells can also produce different results to those in the body. As such, these trials are usually precursors to studies in humans, where this is deemed appropriate.

Case reports and case series. A *case report* is a written record on a particular subject, deployed particularly in a health context. Though low on the hierarchy of evidence, case reports can aid detection of side effects of treatments, for instance. A *case series* tracks multiples subjects. Both cannot prove causation, only correlation, and can reveal areas for potential further investigation.

Cohort studies involve selecting of a group of people sharing a certain characteristic or treatment, and comparing this group, over a period of time, with another group of people who do not have this characteristic or treatment, noting any difference in outcome.

Cross-sectional studies involve the analysis of data collected from a sample of the population at a specific point in time.

Longitudinal studies involve repeated observation of the same variable over an extended period of time.

Field studies take place in the natural setting of the subject.

Randomized controlled trials. Subjects are randomly assigned to a test group, which receives the treatment, or a control group, which commonly receives a placebo. In 'blind' trials, participants do not know which group they are in; in double-blind trails, the experimenters do not know either. Blinding trials help remove bias.

Reviews are based on other published articles. It does not report original research. Review articles generally summarize the existing literature on a topic in an attempt to explain the current state of understanding on the topic. Reviews help mitigate bias in individual studies and give us a more complete picture, making them the best form of evidence. Review articles can be of three kinds:

Narrative review explains the existing knowledge on a topic based on all the published research available on the topic.
Systematic review draw on multiple RCTs to consider their conclusions and also assess the quality of the studies included.

Meta-analysis compares and combines the findings of previously published studies, usually to assess the effectiveness of an intervention or mode of treatment.

Sources:

Baillargeon, T. Education: Types of Research and Scholarly Articles. (2016, July). Retrieved from: https://www.elsevier.com/connect/infographic-how-to-read-a-scientific-paper

Compound Chemistry. A Rough Guide to Types of Scientific Evidence. (2015, April). Retrieved from: http://www.compoundchem.com/2015/04/09/scientific-evidence/

Compound Chemistry. A Rough Guide to Spotting Bad Science. (2014, April). Retrieved from: http://www.compoundchem.com/2014/04/02/a-rough-guide-to-spotting-bad-science/

Fecht, S. 6 Warning Signs That a Scientific Study is Bogus. (2014, April). Retrieved from: http://www.popularmechanics.com/science/health/a10339/6-warning-signs-that-a-scientific-study-is-bogus-16674141/

McKelvey, C. The definitive guide to understanding science on the Internet (2015, July). Retrieved from: http://www.dailydot.com/geek/science-field-guide/

Raff, J. How to read and understand a scientific paper: a guide for non-scientists. (2013, August). Retrieved from: https://violentmetaphors.com/2013/08/25/how-to-read-and-understand-a-scientific-paper-2/

Rodriguez, N. Infographic: How to read a scientific paper. (2015, August). Retrieved from: https://www.elsevier.com/connect/infographic-how-to-read-a-scientific-paper