

According to the Primary vs. Secondary Articles tab from the Cornell University library, a primary or empirical study article in the sciences is based on original or first-hand research that does not repeat previously published research. These original reports with new research findings contrast review articles that contain the research literature of a discipline, or the review articles analyze previous data and trends with secondary research questions posed regarding past gaps in information. The usual sections of a primary article contain the IMRAD (introduction, methods, results, and discussion) methodology with references. The IMRAD structure of an empirical research report or primary article includes the following: an introduction that states why the new research is important and closes gaps in previous research in literature reviews; a methods section that describes the procedure or approach and equipment or samples used for the research; a results section that presents the new findings including quantitative and qualitative data; and a discussion section with commentary of the new findings that includes limitations and prospects of future additional research. Primary articles are usually peer-reviewed as a gate-keeping and deliberative process that examines the value of new findings in relation to previous research in a discipline.

According to the Cornell University library, a review article synthesizes the research literature of a topic within a discipline. A review article is a secondary source that summarizes past research with references of primary articles in a more digestible format. Review articles can be particularly useful for audiences who are not literate or experienced in a subject matter and want to become familiar with existing research in that subject matter. However, a review article differs from a meta-analysis and a systematic review in that it does not synthesize all the scholarly research in a particular subject matter or a research question or does it analyze different studies and data. In contrast to a primary article, a review article is not peer-reviewed as it synthesizes multiple studies of peer-reviewed articles on a particular subject.

The peer-review process ensures that the new findings of a researcher(s) are accurate, and the methodology (or IMRAD) can be replicated with the findings supporting the hypotheses and conclusions. The peer review process is conducted by many scholars or experts in the field of the researcher(s) who differentiate the value of the new research in answering a research question or bridging the gap or limitations in existing research. A peer-reviewed primary article reassures the audience that the findings and methods of the researcher(s) are of quality that are accepted by a scholarly community. According to the intro to peer review video by North Carolina State University, the peer review process starts with a researcher submitting a draft of research findings and methods to a scholarly journal to which the editor who approves it sends to a scholarly community of experts. These experts or reviewers in the researcher's field review the article for its significance and quality of its methodology as well as how original the findings and conclusions are. The reviewers determine if the research is worthy of publication and is significant to their field with an accept or reject decision to the editor of the scholarly journal. The reviewers may add suggestions for revisions, and the scholarly journal editor ultimately determines to accept, reject, or revise the article at the end of the selective or gate-keeping peer review process.

An overview of the peer review process can be described in the following series of events: A researcher completes a study and writes a manuscript consisting of an introduction or purpose of the research, methods or experimental design, results, and conclusions; the researcher

then submits the manuscript to a journal relevant to the study's subject; the editors of the journal determine if the manuscript is beneficial for the journal in an initial review; the accepted manuscript is sent to peer reviewers who evaluate the validity and originality of the research, its methods, and the significance of the research in advancing the field; peer reviewers give recommendations to accept, reject, or improve the manuscript before publication; and the manuscript is published in the journal once it is accepted by peer reviewers or improved by journal editors following revision recommendations by peer reviewers.

The primary article given is *Permanent inactivation of Huntington's disease mutation by personalized allele-specific CRISPR/Cas9*. This is an original article with new research findings presenting a "novel strategy" of inactivating the mutant allele using the haplotype-specific CRISPR/Cas9 sites by HTT allele-specific inactivation. This follows the primary or empirical study article format with IMRAD that expands on existing research and known facts of Huntington's disease. The authors "recently discovered" genetic loci associated with the difference between observed and expected age of motor neurodegenerative signs. The primary article poses a research question they answer in bridging the gap in past research of mechanism-based treatments for Huntington's disease to permanently inactivate the gain-of-function mutation of the HTT gene. The authors state their methods and findings with a discussion of the implications of their findings of improving allele specificity, reflecting that of a primary IMRAD article. The review article given is *Huntington's Disease: Mechanisms of Pathogenesis and Therapeutic Strategies*. The review article synthesizes known information about Huntington's disease from past studies with references to existing primary articles without being peer-reviewed for a journal like the primary article. The review article does not seek to answer a new research question with research producing new findings supporting previous studies. The article does not have the IMRAD format as it analyzes or reports on the structure and functions of huntingtin protein in its wild type and mutant forms.

#### Additional Sources:

George Mason University. (n.d.). Writing a scientific research report (IMRAD). The Writing Center. <https://writingcenter.gmu.edu/writing-resources/imrad/writing-an-imrad-report>

Kelly, J., Sadeghieh, T., & Adeli, K. (2014). Peer review in scientific publications: Benefits, critiques, & a survival guide. *EJIFCC*, 25(3), 227–243.