

# UNDERSTANDING A META-ANALYSIS

**Meta-analysis:** the statistical combination of results from two or more separate studies.

## Reasons for Conducting a Meta-Analysis

- To increase statistical power – the chance of detecting a real effect as statistically significant (if it exists)
- To improve precision
- To answer questions not posed by the individual studies
- To settle controversies arising from apparently conflicting studies
- Generate new hypotheses

In order to perform a meta-analysis you need to have a group of studies which are similar – this similarity is referred to as homogeneity. As a minimum, studies should be homogeneous in terms of participants, interventions, and outcomes so the meta-analysis can determine a meaningful conclusion.

Any kind of variability among studies is referred to as heterogeneity. According to Cochrane these are the kinds of heterogeneity:

- **Clinical diversity** – where participants, interventions and outcomes differ between studies
- **Methodological diversity** – where there is variability in study design
- **Statistical heterogeneity** – where the observed intervention effect differs between studies because of chance

It is important to measure and address heterogeneity in systematic reviews as it affects the extent to which conclusions can be relied on.

## Independent Variables vs. Dependent variables

**Independent Variable:** The independent/manipulated variable is the one that you are able to change. It can be manipulated. Researchers manipulate the independent variable and analyze changes in the dependent variable that occur as a result of this manipulation.

**Dependent Variable:** The name for the dependent variable says it all. The dependent variable is dependent on the changes in the independent variable (or at least that is what researchers suspect)

## Additional Considerations

- Potential advantages of meta-analyses include an improvement in precision, the ability to answer questions not posed by individual studies, and the opportunity to settle controversies arising from conflicting claims. However, they also have the potential to mislead seriously, particularly if specific study designs, within-study biases, variation across studies, and reporting biases are not carefully considered.
- It is important to be familiar with the type of data (e.g. dichotomous, continuous) that result from measurement of an outcome in an individual study, and to choose suitable effect measures for comparing intervention groups.
- Most meta-analysis methods are variations on a weighted average of the effect estimates from the different studies.
- Studies with no events contribute no information about the risk ratio or odds ratio. For rare events, the Peto method has been observed to be less biased and more powerful than other methods.
- Variation across studies (heterogeneity) must be considered. Random-effects meta-analyses allow for heterogeneity by assuming that underlying effects follow a normal distribution, but they must be interpreted carefully. Prediction intervals from random-effects meta-analyses are a useful device for presenting the extent of between-study variation.
- Many judgements are required in the process of preparing a meta-analysis. Sensitivity analyses should be used to examine whether overall findings are robust to potentially influential decisions.



For more information on understanding a meta-analysis, please contact AAPD Research Project Manager Rachel Wedeward, MLIS, AHIP at [rwedeward@aapd.org](mailto:rwedeward@aapd.org).