

## Statistical Methods/Data Analysis<sup>12</sup>

Industrial/Organizational (I-O) psychology is the study of behavior in organizational settings and the application of the methods and principles of psychology to address work related issues (e.g., selection, training, appraisal, etc.) in these settings. This involves both the knowledge of psychological theories and principles as well as the knowledge of different types of statistical techniques (e.g., descriptive and inferential statistics) for data analysis and data interpretation purposes. The following is a brief summary of the most commonly used descriptive and inferential statistics in the field of industrial-organizational psychology.

*Descriptive statistics* refer to the procedures used for summarizing data, the most common of which are frequency tables, graphs and measures of central tendency and variability (Sheskin, 2011). Estimates of central tendency involve the identification of one number that best represents all identified values of a distribution, whereas estimates of variability refer to ways of describing the spread of scores around the mean (i.e. the dispersion in a data set) (Aron, Coups & Aron, 2013). The most commonly used measures of central tendency are the *mean*, *median* and *mode* and the most frequently used measures of variability are *range*, *variance* and *standard deviation*. These statistics are often used by I-O psychologists to summarize and understand pattern of data gathered from empirical research. For example, an organizational psychologist may conduct a job satisfaction survey in an organization and compute a mean to estimate the average level of job satisfaction in the employees. Similarly, computing a standard deviation would provide an estimate of the variability of satisfaction scores of employees with respect to the average.

*Inferential statistics* involve the use of sample data to draw inferences (i.e. derive conclusions) or make predictions about the population from which the sample was derived, (Sheskin, 2011). Inferential statistics are used by I-O psychologists for various purposes including prediction of employee performance, selection of predictors, and solving organizational problems related to employee turnover, employee theft, attitude in the workplace, etc. (Spector, 2012). When the purpose of research is to test for significant differences between two groups, *t-tests* are utilized. For example, if a human resource manager is interested in measuring the effectiveness of a new Microsoft word training program, they can administer a pre-test before the training to measure baseline skills of the trainees and then administer a post-test after they have completed the training. The manager can then utilize a *dependent means t-test* to compare pre-test and post test scores and assess improvement in Microsoft word skills in the trainees as a result of the training program. Similarly, *analysis of variance* (ANOVA) procedures are used to test for significant differences when there are three or more groups, whereas *multivariate analysis of variance* (MANOVA) is used to test for significant differences between more than two groups with regard to more than one dependent variable (Aron, Coups, & Aron, 2013). For example, an I-O Psychologist may use analysis of variance procedures to compare the effects of different types of training programs on employee performance.

In addition to comparing differences between groups, research in the field of I-O psychology also involves the assessment and prediction of the relationship between variables (e.g., in the employment context, usually predictor and criterion variables). These relationships are assessed using correlational procedures. *Correlations* are used in organizational research to measure the degree of association between variables (Sheskin, 2011). For example, if an I-O psychologist conducts a job satisfaction survey of employees, correlations could be used to assess the relationship of different factors (e.g., job demands, job stress etc.) with job satisfaction. *Regression* procedures are used to predict one set of scores (criterion scores) from another set of scores (predictor scores) and *multiple regression* procedures are utilized to predict criterion scores from a combination of predictors. In employee selection contexts, regression statistics are often used by I-O psychologists for the prediction of job performance from a battery of selection tests i.e. regression analysis can help identify how well the scores on an interview, cognitive ability test and personality test would predict future performance of an applicant, in addition, it will also allow to estimate the extent to which cognitive ability measures predict job performance in comparison to an interview or personality measure (Cascio & Aguinis, 2011). Similarly, *multilevel modeling* procedures can be used to look at how individuals grouped into work teams, working under different supervisors, perform their jobs.

The statistical techniques discussed above allow I-O psychologists to describe data and make inferences regarding data collected for various organizational and research purposes. Another domain of I-O research involves conducting

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quantitative reviews of literature i.e. *meta-analysis*, for validity generalization purposes. The goals of a meta-analysis are to understand the relationship between two variables across studies and the variability of this relationship across studies (Aguinis, Sturman, & Pierce, 2008). In I-O psychology, meta-analysis has been used extensively to provide a quantitative integration of validity coefficients computed in different samples (e.g., to provide validity estimates of selection tools, Schmidt & Hunter, 1998). Taken together, these statistical tools allow I-O psychologists to make generalizations, interpretations and inferences from empirical data to address issues in the workplace.

### References

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