Evaluating mediation and moderation effects in school psychology: A presentation of methods and review of current practice

Amanda J. Fairchild*, Samuel D. McQuillin

Department of Psychology, University of South Carolina, Barnwell College, Columbia, SC, 29208, United States

Abstract

Third variable effects elucidate the relation between two other variables, and can describe why they are related or under what conditions they are related. This article demonstrates methods to analyze two third-variable effects: moderation and mediation. The utility of examining moderation and mediation effects in school psychology is described and current use of the analyses in applied school psychology research is reviewed and evaluated. Proper statistical methods to test the effects are presented, and different effect size measures for the models are provided. Extensions of the basic moderator and mediator models are also described.
© 2009 Society for the Study of School Psychology. Published by Elsevier Ltd. All rights reserved.

Keywords: Mediation; Moderation; Interaction effect

Across disciplines, researchers are recognizing the advantage of integrating more sophisticated methodology into their statistical toolkits. Advanced statistical models allow the investigation of complex research hypotheses that may better approximate the multi-faceted reality from which data are drawn, permitting for example, the investigation of differential growth trajectories of behavioral change, nested data structures such as individuals

---

within schools, or multivariate processes that underlie or modify other bivariate relations. This latter class of models, sometimes referred to as third variable effect models, has received particular emphasis recently because these models allow for an understanding of the factors that may modify or inform the relation of two other variables. However, the utility of these methods is limited if their implementation does not reflect best practices currently advocated in the methodological literature.

The purpose of this paper is to describe two third-variable effect models, specifically mediation analysis and moderation analysis, for the school psychology audience and to present current methodological recommendations for their implementation in applied research. We first describe the utility of implementing the models in school psychology research and provide an example application of the models. We then conduct a literature review of how mediation analysis and moderation analysis have been applied in three top school psychology journals over the past 23 years to gauge current practice. We follow with a presentation of the basic mediation and moderation models, illustrating the most recent recommendations for their statistical estimation, and briefly discuss advanced models that involve the effects.

Why study mediation and moderation?

Although evaluating bivariate relations between variables can lend insight into whether a hypothesized relation holds or whether a program appears to work, it cannot address questions of why, how, and for whom the relation holds, or the program works. Investigating third variables such as moderators and mediators permits the investigation of such questions, informing both theory and evidence-based practice in school psychology. A moderator variable is a third variable (Z) that changes the relation between a predictor (X) and an outcome (Y), thereby affecting the strength and/or direction of the relation between the two variables. Moderators demonstrate the generalizability of the relation between X and Y, illustrating the context(s) under which the relation holds. Moderation effects are often referred to as statistical "interactions" in the social science literature; the terms are interchangeable and refer to the same phenomenon. A mediator variable (M) is a third variable that explains how or why two other variables (i.e., X and Y) are related. In a mediation model, the independent variable (X) predicts the mediator variable (M) which in turn predicts the outcome (Y). Thus, a mediator is intermediate in the relation between X and Y. By modeling an intermediate variable in the X–Y relation, the overall effect between X and Y can be decomposed into component parts called the direct effect of X on Y and the indirect effect of X on Y through M (i.e., the mediated effect). Investigating both direct and indirect effects often provides more insight than simply evaluating the bivariate X–Y relation alone, and researchers have proposed several different ways to statistically test mediation using the component parts.

Studying mechanisms of change by investigating mediator variables has the potential to direct and refine the development of evidence-based interventions because it can shed light on how an intervention achieves its effects (or alternatively why it fails to achieve effects). Additionally, studying contextual effects by investigating moderator variables has the potential to extend the generalizability and external validity of evidence-based treatment programs to different cultural groups or in different settings. By analyzing mediation and moderation effects in this way, researchers can promote theory refinement and positively affect practice.