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Problems with detecting moderators in leadership research using moderated multiple regression

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Abstract

A number of recent leadership studies have questioned whether situational variables are important moderators of leadership effectiveness. Pessimistic conclusions from these studies regarding situational modifiers challenge the foundations of path–goal and substitutes for leadership theories. However, analysis of this research reveals questionable methodological practices that cast doubt on the validity of these conclusions. This article discusses two methodological issues, elucidates specific flaws in methods used in recent leadership studies, and makes recommendations for the use of moderated multiple regression (MMR) in leadership studies. We argue that low power to detect moderators and inappropriate use of regression methods can account for the lack of confirmatory findings regarding moderators. Comparative analysis using a previously published data set provides strong support for major arguments presented in this article. We conclude that situational variables are important moderators of leadership effectiveness and are detectable using appropriate procedures.

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1. Introduction

Practitioners and leadership researchers have long assumed that the effectiveness of leaders is dependent upon situational factors. These situational variables are referred to as moderators if they interact with a leader behavior to change the leader's impact. Recent debate has focused on the prevalence of moderator variables and their interpretation. Conclusions from

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recent studies challenge the notion that situational variables are important moderators of the effect of leader behaviors on criteria (Podsakoff & MacKenzie, 1997; Podsakoff, MacKenzie, Aherne, & Bommer, 1995; Podsakoff, MacKenzie, & Fetter, 1993; Podsakoff, Niehoff, MacKenzie, & Williams, 1993). If these conclusions are correct, the validity of two major streams of leadership research—path–goal (House, 1971, 1996; House & Dessler, 1974; House & Mitchell, 1974) and substitutes for leadership theories (Howell, Dorfman, & Kerr, 1986; Kerr & Jermier, 1978)—must be questioned.

Researchers in other areas of organizational behavior, human resources management, industrial/organizational psychology, and related disciplines have also noted difficulties in detecting the existence of hypothesized moderating effects (e.g., Aguinis, 1995; Aguinis & Stone-Romero, 1997; Dunlap & Kemery, 1988; McClelland & Judd, 1993). A number of factors have been identified across various literatures that affect the ability to detect moderators using moderated multiple regression (MMR). This article discusses these methodological issues, elucidates specific flaws in methods used in recent leadership studies, and makes recommendations for the use of MMR in leadership studies. We also provide data from previously published leadership studies to demonstrate our main points.

2. Moderated multiple regression

MMR is the preferred statistical method for identifying moderator effects (interaction effects) when the predictor and the moderator are continuous variables or when the predictor is continuous and the moderator is categorical (Aiken & West, 1991; Cohen & Cohen, 1983; McClelland & Judd, 1993; McNeil, Newman, & Kelly, 1996; Stone-Romero, Alliger, & Aguinis, 1994). ANOVA can also be used for identifying interactions, but is more appropriately used for the analysis of planned experiments than for observational and survey data (Aiken & West, 1991). A moderated relationship is one in which a variable (Z) interacts with a predictor variable (X) to change the relationship between the predictor and an outcome (criterion) variable (Y). MMR provides a straightforward method of testing whether the form of the relationship (represented graphically by the slope of the regression line) changes with the addition of a moderator (Podsakoff et al., 1995; Stone & Hollenbeck, 1989). Changes in form are clearly hypothesized in both the substitutes for leadership theory and path–goal theory.

To test for a moderated relationship using MMR, an interaction term that is formed as the product of the independent variables, is added to a regression equation that first contains the variables of which the interaction term is comprised. For example, if we were interested in whether a variable Z moderates the relationship between some variable X and a criterion Y , we would express that interaction as XZ . In the regression equation, the interaction is carried by the XZ term as shown below.

$$Y = \alpha + \beta_1 X + \beta_2 Z + \beta_3 XZ \quad (1)$$

The main effects of the X and Z variables are linearly partialled from the XZ term by entering the X and Z variables into the regression equation along with the XZ term. Both the lower order

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