Moderation in sport management research: room for growth

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ABSTRACT
Moderators are variables that affect the relationship between a predictor and outcome. They help to clarify otherwise ambiguous patterns of results, extend theory, and signal the growth of a field. Given the importance of moderators, the authors offer an overview of methodological and statistical considerations for testing moderation and then examine sport management scholars’ use of moderation in their research. A content analysis of European Sport Management Quarterly, Journal of Sport Management, and Sport Management Review shows that tests of moderation have not followed the growth in scholarship in the field. Further analyses showed (a) analysis of variance was the most popular analytical tool employed; (b) one in six tests of moderation were conducted incorrectly; and (c) 13% of tests for moderation were conducted absent specific hypotheses or research questions. The authors offer implications for sport management researchers.

KEYWORDS
moderation; theory; research; moderate

Introduction

Moderators are variables that affect the relationship between two other variables (Baron & Kenny, 1986). That is, the relationship between the predictor and outcome variables are dependent upon the level of the third variable: the moderator. Moderators differ from mediators, as the latter helps explain the linkage between the predictor and outcome (Baron & Kenny, 1986). In other words, mediators represent the mechanism through which one variable is associated with another (Frazier, Tix, & Barron, 2004).

To help illustrate, consider the following example (see Figure 1). Suppose a research team is interested in understanding the effects of an inclusive organizational culture on organizational performance. A direct effects model, shown in Figure 1A, suggests that an inclusive culture is directly associated with performance, such that as inclusiveness increases, so too does performance. Alternatively, the research team might draw from theory suggesting that an inclusive organizational culture would help to attract and retain a diverse group of employees, and it is the resultant variety of employee perspectives and experiences that gives rise to improved performance (Fink & Pastore, 1999). In this case, the path from organizational culture to performance is mediated by employee diversity (Figure 1B). Finally, the research team might adopt a moderation approach (see Figure 1C). Here, employee diversity is likely to give rise to improved performance, but only under certain conditions. Diverse workplaces are likely to outperform their peers across a host of indicators when the organizational culture is inclusive, but those performance gains are unlikely to materialize when the culture is exclusionary (Doherty & Chelladurai, 1999; for empirical support, see Cunningham, 2009, 2011a, 2011b). In this example, the relationship between employee diversity and performance is dependent upon the inclusiveness of the organizational culture; thus, culture serves as a moderator.

As our brief illustrations demonstrate, researchers are likely to realize considerable value by moving beyond direct effects. Although both mediation and moderation are important to consider, we suggest that sport management researchers are relatively unlikely to employ moderators in their analyses—a point for which we offer empirical support in subsequent sections. The relative exclusion of moderation is unfortunate for a number of reasons, including those related to theory advancement and the development of the discipline. As such, the purposes of this article are to: (a) explicate the value of including moderators in sport management research; (b) offer an overview of methodological and statistical considerations in testing moderation; (c) examine the prevalence of moderation in sport...
management research through a content analysis of three journals (European Sport Management Quarterly [ESMQ], Journal of Sport Management [JSM], and Sport Management Review [SMR]); and (d) offer recommendations moving forward.

**The Value of Moderators**

Researchers are likely to realize a number of benefits through their inclusion of moderators. The first is in the explanation of what are otherwise equivocal results. In their reviews of the extant research in a particular area, the authors may note the equivocal nature of findings, such that some researchers have observed positive associations among variables, some have observed negative relationships, and others have reported null findings. In these cases, it is possible a third variable, the moderator, serves as the missing piece of the puzzle. For example, Chen, Housner, and Gao (2017) found that weight change served to moderate the relationship between time and performance in various physical activities, thereby highlighting the importance of maintaining normal weight during childhood and adolescence. In other studies, Gao, Liu, Lodewyk, Zhang, and Kosma (2011) argued that the relationship between outcome likelihood and subsequent behaviors might be moderated by outcome value, whereas Gaudreau, Fecteau, and Perreault (2010), in their multilevel analysis, observed that the motivation of dyads served to moderate the relationship between an individual’s motivation and subsequent performance. As a final example, Funk and Pritchard (2006) examined how people respond to negative information about professional baseball teams. They observed that fan commitment moderated the relationship between negative information and attentiveness to the news, such that less committed fans were more attentive to the negative information, relative to their more strongly committed counterparts. Though just some of many examples, the literature cited here does show the role of moderators in clarifying what had otherwise been ambiguous information.

In addition, moderators represent a way of extending theory. Good theory explains why various phenomena occur, and importantly, also detail when, where, and under what conditions (Bacharach, 1989; Cunningham, Fink, & Doherty, 2016; Whetten, 1989). Moderators have the potential to offer such explanations (Colquitt & Zapata-Phelan, 2007). As an example, scholars and practitioners have suggested that participation in Sport for Development (SFD) programs can result in meaningful change for individuals and communities. Recently, however, several authors have argued a number of factors influence the relationship between SFD programming and positive outcomes, including leveraging community celebrations (Welty Peachey, Borland, Lobpries, & Cohen, 2015) and the inclusive principles embedded in the organization (Schulenkorf, 2017), and the shift of management and power to local communities (Edwards, 2015), among other factors. These extensions help advance theory about SFD and ultimately the effectiveness of its delivery (Cunningham, 2013; Doherty, 2013).

Finally, if moderators help to resolve an otherwise ambiguous pattern of findings and extend theory, they also represent growth in an academic field. Indeed, Aguinis, Edwards, and Bradley (2017) referred to moderators as central to the field of management and strategic management, and in this spirit, we contend as much for sport management, as well. That is, as the field progresses, so too will scholars’ use of moderators to more precisely articulate when, where, and under what conditions various factors affect the management, marketing, and governance of sport.

**Theoretical, Methodological, and Statistical Considerations**

We recognize that scholars can employ qualitative methods to identify important moderators (see, for example, Welty Peachey et al., 2015). That noted, our focus in this section is on specifying considerations for scholars employing quantitative methods. We do so because even though most of the scholarship in the area is quantitative in nature, researchers commonly commit errors when empirically testing moderation. Aguinis et al. (2017), for example, cited insufficient statistical power, unequal sample sizes among subgroups, the categorization of continuous variables, and
the incorrect interpretation of first-order and interaction effects as among the most common errors.

**Methodological Approaches**

From a methodological standpoint, sport management researchers have generally conducted experiments (e.g., Doyle, Pentecost, & Funk, 2014) or conducted cross-sectional surveys (e.g., McDonald, Leckie, Karg, & Zubcevic-Basic, 2018) to collect data. Sport economists will commonly utilize interactions in their models, and they usually draw from archival or public datasets for their sources (e.g., Tainsky, Kerwin, Xu, & Zhou, 2014). In any of these approaches, researchers should strive to ensure near-equal sample sizes in the moderation subgroups, as variations can result in range restriction (Aguinis, Boik, & Pierce, 2001). In addition, although we recognize the expense in doing so, researchers benefit from obtaining a large sample size, thereby avoiding the problem of being under-powered (Aguinis, Beaty, Boik, & Pierce, 2005). Finally, scholars would do well to ensure all measures have high internal consistency, as measurement error drastically reduces the potential of observing significant moderation effects (Busemeyer & Jones, 1983).

Finally, though less common, some researchers have begun to use meta-analysis (Cunningham, Dixon, Ahn, & Anderson, 2017a, b; Kim, Lee, Magnusen, & Kim, 2015), which is a quantitative procedure that allows for the statistical aggregation of previous quantitative work (Cooper, 2010). In doing so, the researchers examine the effects of various associations or treatments, as well as the influence of various moderators. Frequently investigated moderators in meta-analysis include publication type (published or not), context, demographic variables, work characteristics, or other categorical variables (see also Cooper, 2010).

**Statistical Considerations**

In addition to highlighting methodological points to consider, we offer an overview of statistical procedures used in testing moderation. Given that sport management scholars commonly employ analysis of variance and related procedures, and thus likely have a firm grasp of those techniques, we focus our discussion on moderated regression analysis and structural equation modeling (SEM). We offer specific examples in the following sections, and Ntoumanis and Appleton (2016) offer additional examples in their review of mediation and moderation analysis for exercise scientists.

**Regression**

Moderated regression is perhaps the most popular approach to testing moderation, as researchers generally follow guidelines recommended by Aiken and West (1991) or more recently, Cohen, Cohen, West, and Aiken (2003). The regression equation is as follows:

\[
\hat{Y} = B_1X + B_2Z + B_3XZ + B_0
\]

where \(\hat{Y}\) is the dependent or outcome variable, \(X\) is the independent or predictor, \(Z\) is the moderator, and \(XZ\) is the interaction term. To reduce multicollinearity, Cohen et al. (2003) suggest first centering the independent and moderator variables, such that the mean for each item is subtracted from the overall mean for that variable. The centered variables are then multiplied together to create the interaction term. As an alternative process, and one we have found to be less cumbersome, researchers can instead standardize the variables (Aiken & West, 1991). In both cases, the mean score for both variables will be zero, but the standard deviations (SDs) will vary between centered variables (same SD as the original variable) and the standardized variable (SD of one). Standardizing the variables makes plotting the interactions and examining the simple slopes easier, as researchers examine points 1 SD above and below the mean. As with the centered variables, researchers multiply the standardized variables together to create the interaction term.

In computing the moderated regression, any control variables are entered in the first step, the first-order effects—that is, the centered or standardized independent variable and the moderator—are entered in the second step, and the interaction term is entered in the third step. The process we describe allows researchers to explore the unique variance of each step. That noted, Aguinis et al. (2017) urge researchers to interpret first-order effects only once all variables are entered, including the interaction term. They note that failing to do so “is problematic because when an interaction exists, the predictor involved in the interaction does not have a single unique effect but instead has a range of effects that vary according to the level of the moderator variable” (p. 672).

If the interaction term is significant, the next step is to examine the nature of the interaction. Cohen et al. (2003) offer the most commonly used approach: simple slopes analysis. In this analytic approach, researchers compute two regression lines between the predictor and outcome variable: one for low and one for high levels (±1 SD) of the moderator. Confidence intervals can also be calculated for each simple slope (Cohen...
This approach allows researchers to examine statistically the influence of the moderator at different levels. After doing so, we have also found value in plotting the lines, again at ±1 SD of the moderator, to aid the reader in visualizing the differences. Even doing so, the statistical test of moderator and the hypotheses is conducted through the simple slope analysis, not the plot alone.

In addition, scholars can develop models that combine moderation and mediation. The most common among these is moderated mediation, where another variable alters the mediating effect between the independent and dependent variables (Baron & Kenny, 1986; for examples in sport management, see Jang, Wann, & Ko, 2018; Sartore-Baldwin & Walker, 2011; Steward & Cunningham, 2015). Analyses from management and organizational psychology show scholars are comparatively unlikely to employ these models in their research (Aguinis et al., 2017). Of those who do theorize moderated mediation, some researchers evaluate the mediating effects and moderating effects separately, though such an analytical approach is not preferred (Edwards & Lambert, 2007).

Hayes and colleagues (Hayes, 2018; Hayes, Montoya, & Rockwood, 2017; Preacher, Rucker, & Hayes, 2007) developed a number of options in testing moderated mediation, or what they refer to conditional process models. Three options are common, and we draw from our previous example of employee diversity, organizational culture, and organizational performance to illustrate. Suppose, for example, that a research team suspected that employee diversity resulted in a more creative workplace because of the varied ideas and perspectives that employee diversity brought, and its creativity mediated the relationship between employee diversity and subsequent performance (see Cunningham, 2011a; Florida, 2012). Organizational culture can moderate this mediation in a number of ways, creating various opportunities for conditional effects (see Figure 2). It is possible that employee diversity results in a creative workplace only when the culture is inclusive, thereby allowing people to express freely their ideas and viewpoints. Such dynamics create a first-stage conditional process (Hayes et al., 2017; see Figure 2A). Alternatively, the research team might argue that creativity only results in performance gains when an inclusive workplace is present, which is consistent with second-stage conditional processes (Hayes et al., 2017; see Figure 2B). As a final option, the researchers might suggest that organizational culture influences all aspects of the organization, and as such, is likely to affect both paths. In this case, they have hypothesized a first- and second-stage conditional process model (Hayes et al., 2017; see Figure 2C). They can then test their respective models through regression analysis using the PROCESS macros Hayes and colleagues developed (Hayes, 2018; Hayes et al., 2017).

**SEM**

Researchers can also use SEM to test moderation. One approach is to compute a multigroup analysis with simultaneous estimation (Byrne, 2004). With this technique, researchers specify structural models with the predictor and outcome variables and then sequentially compare various models to test for invariance, or lack thereof. Many options exist for then testing for invariance (e.g., Acock, 2013; Byrne, 2004; Jöreskog, 1971; Vandenberg & Lance, 2000). Dimitrov (2010) summarized the steps as follows. Researchers first test for configural invariance, such that they test the fit of baseline models of the two groups. They follow this step by examining weak, strong, and strict measurement invariance, respectively. Investigation of weak (metric) invariance involves constraining factor loadings to be equal at each level of the moderator and comparing this model to the configural model. Researchers can then statistically compare the models using the chi-square difference test or change in confirmatory fit index (CFI) of −.01 to accept or reject invariance (see also Cheung & Rensvold, 2002). Testing for strong (scalar) invariance entails also constraining the item intercepts to be equal, and this model (where factor loadings and intercepts are constrained) is compared to the weak invariance model. Next, examining strict (residual) invariance involves also constraining the error variances and covariances to be equal and then comparing to the strong invariance model. Assuming weak invariance is present and at least partial strong and strict variance are present (see Dimitrov, 2010, for further discussion of weak invariance), the scholar then constrains the structural paths hypothesized to vary based on the level of the moderator.

![Figure 2](image-url)
Though we outline various steps for testing for invariance, several scholars have recognized that requiring strict or even strong invariance might be overly restrictive (Byrne, 2004; Dimitrov, 2010). At a minimum, we see value in testing for weak invariance first because if factor loadings are not invariant, units of measurement vary based on the level of the moderator. Thus, subsequent tests are not meaningful. Assuming weak invariance, scholars can then test a model in which the factor loadings and hypothesized structural paths are constrained, and statistically test this model against the weak invariance model. If the models are statistically different, then the structural paths also vary based on the moderator, thereby signaling support for the hypothesized moderation.

Though multigroup estimation through SEM is a relatively straightforward procedure, it is not always appropriate, such as when the moderator variable is continuous in nature. We recognize that some researchers will dichotomize continuous variables in order to run these analyses (or analysis of variance procedures), but doing so has negative measurement and statistical consequences (MacCallum, Zhang, Preacher, & Rucker, 2002). Thus, when researchers have moderator variables that are continuous in nature, multigroup comparison is not appropriate.

As alternate approach, and one that is preferred when researchers have continuous moderator variables, is to build latent interactions into the SEM. Though several options exist (for reviews, see Little, Bovaird, & Widaman, 2006; Moulder & Algina, 2002), we focus on Marsh, Wen, and Hau’s (2004) approach because of its widespread use and the efficacy of the approach relative to other, more computationally complex alternatives. Following their approach, researchers specify the latent variables for the predictor and moderator variables, and then create interaction terms for each of the item indicators for the new latent interaction variable. To illustrate, suppose that (a) a research team was interested in examining if team identification moderated the influence of perceived team efficacy and subsequent intentions to attend games; and (b) each of the variables of interest was measured with three items. In specifying the structural model, the researchers would first standardize or center the indicator variables for the predictor ($x_1$, $x_2$, $x_3$) and moderator ($z_1$, $z_2$, $z_3$) and then create interaction terms for each indicator of the latent interaction variable ($x_1z_1$, $x_2z_2$, $x_3z_3$). Thus, the three exogenous latent variables—the predictor, moderator, and interaction latent variable—would each have three item indicators, and the researchers would model each to predict the one endogenous variable, the outcome.

Marsh et al. (2004) empirically demonstrated the efficacy of this approach relative to more computationally complex alternatives, and sport management scholars have drawn from this approach to test moderation through SEM (e.g., Cunningham, Choi, & Sagas, 2008). Marsh et al. also recognized that researchers sometimes measure variables using different numbers of items. In drawing from the previous example, what would happen if the identification moderator was measured with seven items and the predictor was measured with three? A preferred option is to create parcels—or “an aggregate-level indicator comprised of the sum (or average) of two or more items, responses or behaviors” (Little, Cunningham, Shahar, & Widaman, 2002, p. 152)—for the variable with the larger number of indicators so that that the number of indicators for each latent variable matches. In this case, researchers would average (for example) items 1, 2, and 3 to create parcel 1, items 4 and 5 to create parcel 2, and items 6 and 7 to create parcel 3. The parcels would then serve the same function as item indicators, and the researchers would standardize or center them and then multiply them with the predictor item indicators to create the latent variable item indicators.

As another possibility, suppose the moderator is an observed variable, such as an individual’s race or the weather during the time of an event. Creating interaction terms between the observed variable and each of the item indicators for the latent independent variable duplicates material and is therefore ill-advised (Marsh et al., 2004). In this case, researchers could treat the independent and moderator variables as observed, center or standardize both, and then create a third variable: the interaction term. The three observed exogenous variables would then be modeled to predict the latent outcome variable.

Finally, Sardeshmukh and Vandenberg (2017) recently demonstrated the efficacy of an approach to test moderated mediation through SEM. They also specify the number of theoretical possibilities for specifying moderated mediation. Their article serves as a good guide for scholars seeking to utilize this analytical technique.

### Statistical Packages

Finally, we note that many statistical packages are readily available to conduct the previously described analyses. Scholars can run moderated regression analyses through common statistical software packages, including SPSS, SAS, Mplus, and STATA. Similarly, common software packages used to run structural equation models, such as LISREL, SAS, Mplus, AMOS, and STATA, are capable of the analyses we described.

In addition, some researchers have developed personal websites to assist researchers with additional analyses. Hayes has developed a website (http://afhayes.com/...
index.html) that includes many of the macros needed to run the moderated mediation analyses. Kenny’s website (http://davidakenny.net/cm/moderation.htm) contains introductory information, resources, and some online calculators. As a final example, we have also developed excel files to assist researchers with plotting interactions and conducting simple slope analyses (see http://diversityinsport.squarespace.com/statistical-resources/).

### Moderators in Sport Management Research

Given the overview of methodological and statistical considerations, we turn to an analysis of moderation in sport management research. To do so, we analyzed articles from three sport management journals: ESMQ, JSM, and SMR. We considered each article from the time the journals were first published: ESMQ (2001–2016; n = 337 articles), JSM (1987–2016; n = 704 articles), and SMR (1998–2016; n = 415 articles). Using the journal websites, we conducted searches for articles that included the following key terms: “moderate,” “moderation,” “interaction,” and “interact.” The search came 827 possibilities, and we read each abstract or article to determine if the authors statistically tested moderation. After completing the review process, we identified 114 instances in which authors statistically tested for moderation, and we offer the full list of articles in the Appendix.

We offer an illustrative summary of the results in Figure 3. Results show an exponential increase in the total number of articles published in the three sport management journals over the years. Although the total number of articles including a test for moderation also increased, the trend was not the same. Put another way, though the overall sport management scholarship has increased, the comparative number of studies focusing on moderation has lagged behind. The source did not influence the percentage of articles including moderation, $F(2, 64) = 2.71, p = .07$. ESMQ ($M = .04, SD = .05$), JSM ($M = .09, SD = .06$), and SMR ($M = .06, SD = .06$) were all equally likely to publish an article that included moderation analysis.

We also examined the statistical procedures used for each analysis, identifying if the authors followed recommended steps (as previously outlined). Analyses showed authors did not follow recommended analytical steps 16% of the time. Common mistakes included dichotomizing continuous variables, failing to statistically analyze the nature of the interaction, and not standardizing or centering the variables. In two cases, authors ran separate correlation analyses purportedly to test moderation, though such analyses do not provide such a test. We also ran a logistic regression with correct analysis as the dependent variable and year as the independent variable. The results were not significant, $\chi^2(4) = .03, p = .86$, suggesting that the appropriateness of the analyses, or lack thereof, has remained constant over time.

In addition, we identified the statistical procedures used to test moderation. Researchers most frequently turned to analysis of variance ($n = 60, 52.63$%), followed by regression ($n = 33, 29.95$%), structural equation models ($n = 18, 15.79$%), correlations ($n = 2, 1.75$%), and meta-analysis ($n = 1, .88$%). Mistakes were most likely to occur when authors employed SEM ($27.78$%), $\chi^2(4) = 14.32, p = .006$. We examined the influence of year published on the analysis used via multinomial logistic regression. Analysis of variance served as the comparison point.
Results show year of publication did influence the analysis, $\chi^2(4) = 13.88, p = .008$. Relative to analysis of variance, in articles published more recently, authors were more likely to use regression analysis ($B = .08, SE = .04, p = .02$) and SEM ($B = .15, SE = .06, p = .01$). Year of publication did not influence the comparative frequency of correlations or meta-analysis, relative to analysis of variance. Finally, we examined whether the authors developed specific hypotheses or research questions related to the moderation, or whether the test was ad hoc in nature. Results show that in 13.16% of the articles, the authors did not develop specific predictions related to moderation. Logistic regression showed the year of publication did not influence this outcome: $\chi^2(1) = .92. p = .34$.

**Discussion and Conclusions**

Moderators can play an important role in clarifying otherwise ambiguous relationships, advancing theory, and signaling the maturity of an academic discipline. Despite these many benefits, sport management researchers are relatively unlikely to specify moderators in their theoretical models or to test moderation in their analyses. When they do test for moderation, approximately one in six do so incorrectly, and about 13% do not theorize the anticipated interactions. Finally, while the one might expect some of these missteps to occur in a field’s early years, our data show they have persisted over time.

Given these findings, we offer a number of steps forward. First, there is clearly a need for more theorizing about and testing of moderation. Authors who propose new theories will likely find value in considering how the relationships between two constructs are affected by a third, moderating construct (for recent examples, see Ballouli & Heere, 2015; Kerwin, Walker, & Bopp, 2017; Pickett & Cunningham, 2017). Doing so is an important first step considering the role of theory in spurring subsequent empirical tests and extensions (Cunningham et al., 2016). Authors conducting empirical analyses can seek to rectify what have otherwise been an equivocal pattern of findings by specifying specific moderators in their models. Following this path has the potential to lead to novel discoveries, identification of conditions under which various phenomena occur, or both. In short, the increased use and testing of moderators has the potential to propel the understanding of the governance, management, and marketing of sport.

In addition, when testing moderation, researchers can take various theoretical, methodological, and statistical steps to ensure they best test the predictions. First, theory should drive the test of moderators (see also Frazier et al., 2004). Without theory guiding the analyses, there is no firm articulation of why the relationships might take place, much less when, where, and under what conditions. Further, in drawing from Aguinis et al. (2017; see also Shieh, 2009), we encourage authors to (a) use the most internally consistent measures possible; (b) conduct sampling in a manner that ensures a large sample size and substantially equal sample sizes across moderator subgroups (but see also King, Avery, Hebl, & Cortina, 2017); (c) refrain from artificially dichotomizing moderators that are continuous; (d) interpret the first-order effects when the interaction terms are added; and (e) if the interaction term is significant, take the appropriate steps to statistically examine the nature of the interaction. Finally, relatively few sport management researchers have conducted experiments or quasi-experiments to test moderation. However, in other, more advanced fields, such as psychology, experiments are commonplace, and true experiments have the benefit of signaling causality—something cross-sectional studies cannot do. Future researchers would likely be well served by designing experiments to test their theoretically derived moderators.

Although our analysis makes several contributions, we also recognize potential limitations. First, as we previously noted, our focus was on quantitative analyses and formal tests of moderation. Though researchers employing qualitative methods do not test relationships, they can uncover patterns of findings, and such is certainly the case when it comes to moderation (Welty Peachey et al., 2015). From this perspective, we likely under-report the prevalence of moderation-focused inquiries. Second, we included three sport management journals in the analyses: *ESMQ, JSM*, and *SMR*. These three journals have the highest impact factor of sport management journals and have the broadest reach; thus, we considered them as ideal sources to examine trends in sport management scholarship. That noted, our decision to focus on these journals meant others were excluded from the analysis. Future researchers should extend our study by including other journals and fields, such as sport marketing or sport economics, in the analyses.

In summary, our analyses show that although the specification and testing of moderators has a number of benefits, sport management scholarship in this arena has lagged behind. The result likely is missed opportunities to clarify what have otherwise been ambiguous results, to expand the bounds of current theories, and most importantly, to expand the understanding of the governance, management, and marketing of sport. Given these outcomes, we encourage sport management scholars to include moderators in their theorizing and testing of relationships.

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Appendix


