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A CRITICAL REVIEW AND BEST-PRACTICE RECOMMENDATIONS FOR CONTROL VARIABLE USAGE

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The use of control variables plays a central role in organizational research due to practical difficulties associated with the implementation of experimental and quasi-experimental designs. As such, we conducted an in-depth review and content analysis of what variables, and why such variables are controlled for, in 10 of the most popular research domains (task performance, organizational citizenship behaviors, turnover, job satisfaction, organizational commitment, employee burnout, personality, leader–member exchange, organizational justice, and affect) in organizational behavior/human resource management (OB/HRM) and applied psychology. Specifically, we examined 580 articles published from 2003 to 2012 in *AMJ*, *ASQ, JAP*, *JOM*, and *PPsych*. Results indicate that, across research domains with clearly distinct theoretical bases, the overwhelming majority of the more than 3,500 controls identified in our review converge around the same simple demographic factors (i.e., gender, age, tenure), very little effort is made to explain why and how controls relate to focal variables of interest, and control variable practices have not changed much over the past decade. To address these results, we offer best-practice recommendations in the form of a sequence of questions and subsequent steps that can be followed to make decisions on the appropriateness of including a specific control variable within a particular theoretical framework, research domain, and empirical study. Our recommendations can be used by authors as well as journal editors and reviewers to improve the transparency and appropriateness of practices regarding control variable usage.

A central pursuit of psychological research centered around people at work, as well as organizational research in general, is to describe and explain relationships among variables. Central to this pursuit is the ability

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to identify and isolate factors that explain and predict the phenomena of interest while controlling other relevant variables that may extraneously affect the relationships being investigated. Identification and management of such extraneous (i.e., nonfocal) factors not only represent good science but also are essential for ensuring the generalizability that allows empirical research to benefit individuals, organizations, and society as a whole (Becker, 2005). To this point, use of (a) various types of experimental and quasi-experimental designs, and (b) statistical mechanisms are two methods for addressing such nonfocal confounds (Aguinis & Bradley, 2014; Atinc, Simmering, & Kroll, 2012; Becker, 2005; Brutus, Gill, & Duniewicz, 2010; Carlson & Wu, 2012; Newcombe, 2003). Unfortunately, implementing experimental and quasi-experimental designs is practically difficult in organizational research due to logistical and ethical issues (e.g., Sackett & Mullen, 1993). In contrast, the use of statistical controls is more practically feasible because it mathematically removes variance associated with nonfocal variables (Carlson & Wu, 2012). Similar to how meta-analysis "corrects" for methodological and statistical artifacts in a post hoc manner, using control variables is also a way to "correct" for and improve upon weaknesses in the data collection process. In doing so, rather than holding relevant factors constant across samples or environments through the use of an experimental or quasi-experimental design, researchers measure variables suspected of having a relationship with either a predictor (Breaugh, 2008; Carlson & Wu, 2012) or a criterion (Atinc et al., 2012) and include them in subsequent analyses by, for example, entering them in the first step of a hierarchical regression model. Although *skeptically* referred to as the "purification principle," the general notion behind control variable usage is that researchers can remove predictor-criterion contamination by including confounding variables in their analyses (Spector & Brannick, 2011). We highlight the term "skeptically" because, in spite of its pervasive use in organizational research, this approach includes a number of significant assumptions and potential problems.

Among the many assumptions that accompany statistical control is the belief that these extraneous variables distort (i.e., contaminate) substantive relationships and that the relationships between predictors and criteria are spurious or artificially inflated unless controls are included in the analysis. As a result, there is a common albeit often unsubstantiated belief that the inclusion of control variables purifies results and uncovers "true" relationships (Atinc et al., 2012, p. 59; Carlson & Wu, 2012; Spector & Brannick, 2011). A related assumption, typically given little thought, is that control variables are measured reliably. Importantly, when this taken-for-granted assumption is violated, parsed-out variance could represent the shared variance between controls and focal variables, error variance

(i.e., noise), or meaningful variance. If it is in fact error variance or meaningful variance, then the "confounding" variance that prompted such actions remains. To this point, another common assumption is that the inclusion of control variables, and in particular multiple control variables, is a safer and more statistically conservative approach than not including them (Carlson & Wu, 2012; Spector & Brannick, 2011). Whereas each of these assumptions relies on rather large inferential leaps, perhaps the biggest and potentially most frequently violated assumption is that control variables hold theoretically meaningful relationships with predictors and criteria (Bono & McNamara, 2011; see results by Carlson & Wu, 2012).

Notably, a number of potential problems exist even if each of the aforementioned assumptions are actually met (Aguinis & Vandenberg, 2014). For example, the inclusion of control variables not only reduces available degrees of freedom and statistical power but also has the potential to reduce the amount of explainable variance available in outcomes of interest (Becker, 2005; Breaugh, 2008; Carlson & Wu, 2012). That is, when control variables are related to the predictor or criterion, results may give the appearance that the predictor is not related to the criterion or is related in an unexpected direction when in fact an examination of the zero-order correlations may suggest the opposite is true (Becker, 2005; Breaugh, 2008; Carlson & Wu, 2012; Meehl, 1971; Spector & Brannick, 2011). Such cases can lead to an incorrect conclusion that the predictor is not related to the criterion when, in fact, there is a clear bivariate relationship. On the other hand, by inflating the amount of explainable variance in the criterion, the exclusion of control variables can also lead to an incorrect conclusion that the predictor relates to the criterion when, in fact, there is no such relationship. Accordingly, the inclusion or exclusion of control variables has important implications for theory and practice as such decisions can change substantive study results (e.g., Rode et al., 2007) as well as limit the ability to replicate, extend, and generalize a study's findings (Becker, 2005; Breaugh, 2006; 2008; Carlson & Wu, 2012).

Another often unacknowledged potential problem of using control variables relates to what exactly is being measured or studied (Breaugh, 2008). Specifically, a model including control variables is no longer investigating the relationship between a predictor and a criterion but, rather the relationship between a new *residual* predictor and the criterion. Because residual predictors isolate phenomena that typically coexist in reality, researchers need to be aware that they may be studying a relationship that either does not exist or deviates substantially from actual organizational realities (Newcombe, 2003). For example, consider a study that controls for gender and weight when investigating the relationship between height and career earnings. In an example analyzed by Breaugh (2008), only

40% of the original height variance remained. Height in the final analysis, as a result, did not represent height as one would normally think of it but rather something more closely aligned to physical proportionality. Consequently, Breaugh (2008) noted "it is quite different to conclude that taller individuals earn more than it is to conclude physically well-proportioned individuals earn more" (p. 287).

With these and other issues raising concerns about control variables, Becker (2005) offered an initial attempt to investigate their usage in organizational research. This pioneering review included a sample of 60 articles published during a 3-year period (i.e., 2000 to 2002) in four journals: *Academy of Management Journal* (*AMJ*), *Administrative Science Quarterly* (*ASQ*), *Journal of Applied Psychology* (*JAP*), and *Personnel Psychology* (*PPsych*). In spite of the limited scope of this review, these initial results were as informative as alarming: Roughly 63% of all studies using statistical controls offered no clear justification for at least one of the control variables included in the study. Subsequently, two other studies have added valuable knowledge regarding statistical control variable usage. First, Carlson and Wu (2012) conducted a review including articles published during 1 year (i.e., 2007) in three journals: *AMJ, JAP,* and *Strategic Management Journal* (*SMJ*). In contrast with results reported by Becker (2005), Carlson and Wu ascertained that the number of studies providing no clear justification for control variable usage was only 19%. The efforts by Becker (2005) and Carlson and Wu (2012) were supplemented by those reported by Atinc et al. (2012), who analyzed control variable usage in articles published over a 5-year period (i.e., 2005 to 2009) in four journals: AMJ, JAP, *Journal of Management* (*JOM*), and *SMJ*. By including a larger sample of studies compared to Becker (2005) and Carlson and Wu (2012), Atinc et al. offered additional insights into the use of statistical controls.

This Study

Our study builds upon the pioneering work conducted to date as each contains limitations that point to the need to gain a deeper understanding of control variable usage. For example, Becker (2005) analyzed only 60 studies, and Carlson and Wu (2012) analyzed studies from only a single year. Atinc et al. (2012) included studies from a longer period of time but coded only one control variable per study (i.e., "the one that had the best rationale given," p. 65) and based their conclusions on a mixture of both micro- and macro-level research, which may have skewed results toward macro-practices because those studies (i.e., strategic management, organization and management theory) generally use more control variables than micro studies (Atinc et al., 2012, p. 72). Moreover, although Becker

(2005) and Atinc et al. (2012) included data from multiple years, their date ranges did not allow for an examination of how practices may have changed over time. This point is especially salient as it has been almost a decade since Becker's (2005) seminal article. Yet, beyond these issues, there are important additional needs and questions that remain unanswered as they relate particularly to OB/HRM and applied psychology research. In particular, what specific variables are being controlled for? Are those variables actually related to the phenomena of interest? Are different research domains relying on different bases to justify control variable inclusion? From a future-oriented and prescriptive perspective, how and why should researchers decide whether to include a particular control variable? How can journal editors and reviewers assess the adequacy of a particular control variable included in a manuscript submitted for publication consideration? How can members of a skeptical scientific community evaluate the adequacy of a control variable included in a published article? How should authors describe the manner in which they have handled control variables?

We address the aforementioned questions by conducting a critical review and content analysis of control variable usage across 10 popular OB/HRM and applied psychology research domains: task performance, organizational citizenship behaviors (OCBs), turnover, job satisfaction, organizational commitment, employee burnout, personality, leader–member exchange (LMX), organizational justice, and affect. In doing so, our review offers a number of unique value-added contributions in relationship to our current knowledge regarding control variables. First, it documents what control variables are being used in the context of specific, yet popular, research domains. Such documentation offers a deeper and more fine-grained analysis than previous work. Second, our study also documents the extent to which such controls are related to focal variables. Third, our review includes a content analysis of the justifications given for each control variable used in specific research domains, not only incorporating what previous research has done (Atinc et al., 2012; Becker, 2005; Carlson & Wu, 2012) but also going further by breaking up these justifications across domains, including a deeper analysis and population (i.e., additional categories, more journals, 10-year span), and exploring common combinations of justifications. Finally, given that we cover a 10-year span, our review also examines trends in control-variable usage across time and research domains. It could be, for example, that the types of controls used in current research differ from those used in the past or that the controls used in one research domain differ from the controls used in others. As a result of our review and analysis, we offer a prescriptive and future-oriented set of best-practice recommendations that can be used by authors as well as journal editors, journal reviewers, and a skeptical

scientific readership to improve the transparency and appropriateness of practices regarding control variable usage in OB/HRM, applied psychology, and related fields.

Method

Research Domain and Journal Selection

We selected research domains based on a discussion with five content experts in OB/HRM and applied psychology, each of whom serves on editorial boards and as a reviewer for influential journals. Each expert generated a list of research domains that they considered to be most popular. This task resulted in general agreement around the 10 research domains ultimately selected. Where discrepancies existed, we used the online database ABI/Inform to search for key terms. We selected those terms that returned the greatest number of articles. To assess the validity of this process, we made a comparison between these 10 topics and topics previously reported as the most popular in OB/HRM and applied psychology research (see Cascio & Aguinis, 2008; Morrison, 2010). This comparison demonstrated strong overlap with discrepancies based largely on the specificity of the research domain (e.g., job satisfaction and organizational commitment vs. "work-related attitudes"). In addition, we based our review on articles published in five journals considered to be highly influential (e.g., Harris, 2008; Zickar & Highhouse, 2001): *AMJ, ASQ, JAP, JOM*, and *PPsych*. We focused our review on these five journals because, given their quality and influence, they serve as exemplars for the field.

Study and Control Inclusion Rules

We examined articles published between 2003 and 2012 for potential inclusion. We selected this period to represent the most recent and relevant practices for statistical control and as a means to assess potential changes in control variable usage. Because the focus of our review was on statistical control, we did not include studies that employed experimental (vs. statistical) control, meta-analysis, or studies that included controls for the purpose of conducting tests of mediation. In addition, if two different publications by the same authors used the same data and the same controls, we included only one study in the results described later. We included multilevel studies, but if the authors controlled for the dispersion level (mean level) of a construct when the mean level (dispersion level; e.g., justice climate) of a construct was the phenomenon of interest, that particular control was not included. We also excluded individual-level components (e.g., individual procedural justice) of multilevel constructs/investigations (e.g., justice climate). Finally, we did not include initial measures (e.g., Time 1 measure of construct X) of focal variables studied at later points in time.

In addition to describing excluded studies and controls, it is also important to note certain types of studies and controls that are included in the results of this review. Specifically, we included articles for which authors described potential control variables in the method and/or results sections but ultimately elected not to include them in their analyses because they were unrelated to focal variables or because they did not alter study results. Moreover, we also included those studies that described supplemental analyses in which variables were tested as controls (typically after the fact and ultimately not included because results remained relatively unchanged). Finally, we included those studies that have a Step 1 listed in a regression analysis including variables not described or listed anywhere else in the article. This type of study frequently included demographic variables that were not described in the method section but were clearly included in the analysis and results.[1]

Process of Identifying Studies

Because our review's targeted population included all studies published in *AMJ, ASQ, JAP, JOM,* and *PPsych* from 2003 to 2012, we used a four-step process to identify articles for inclusion. First, we conducted an online keyword search of abstracts to locate studies related to one or more of the 10 research domains. Second, we examined each abstract to determine whether the study was appropriate for inclusion (i.e., we disregarded those studies that referenced meta-analyses, experimental controls, and nonfocal topics such as firm performance). Third, we examined each study's method section to ascertain whether the study included statistical controls. Fourth, when statistical controls were not explicitly referenced in the method section, we performed a within-article full text keyword search of the terms "control," "covariate," and "partial." Combined, these efforts resulted in 580 usable studies.

Job performance. We used a keyword search with the term "performance" to identify potential studies with performance as a focal variable. Because performance in this review explicitly referenced the task performance of employees, we excluded a number of other types and levels of performance. For example, we excluded studies that focused exclusively on firm, top management team, training, bargaining, decision-making, interview, exam, or assessment center performance. Moreover, we also excluded those studies that focused on athletic performance, computer-based simulation performance, and student performance on experimental tasks and/or classroom assignments.

[1]Our goal is to describe practices in the aggregate and not to point fingers at particular authors. As such, examples of each of these aforementioned studies are not cited here but are available from the first author upon request.

Organizational citizenship behaviors (OCBs). We used the terms "citizenship," "OCB," "extra-role," "contextual," "voice," "altruism," "sportsmanship," "helping," "courtesy," "civic virtue," and "conscientiousness" to identify potential studies with OCBs as a focal variable. When voice was used as a search term, we examined the method section to ensure the author's use of the term voice was intended to cover OCBs (i.e., expressing a challenge to the status quo with the intent of improving the situation; Van Dyne & LePine, 1998).

Turnover. We used "turnover" and "quit" as keyword search terms to identify those studies focusing on actual or intended turnover behavior. We excluded those studies examining CEO or other executive turnover because of the macro-level nature of their focus.

Job satisfaction. A keyword search using "satisfaction" identified potential job satisfaction studies. We excluded studies focusing on career, supervisor, classroom, and other types of satisfaction in the results described later.

Commitment. To identify potential studies for inclusion, we searched abstracts for the use of the term "commitment." Once identified, we examined method sections to ensure a focal construct was a form of organizational commitment (i.e., generalized, affective, normative, or continuance). We excluded those studies examining change commitment, occupational commitment, and other forms of commitment from the current review.

Burnout. Although sometimes conceptualized and measured distinctly, we combined emotional exhaustion, depersonalization, and reduced personal accomplishment into one focal topic in this review (referred to from this point forward as burnout). As such, we used the terms "burnout," "exhaustion," "depersonalization," and "personal accomplishment" to identify potential studies for inclusion.

Personality. Our review focused exclusively on the personality traits known as the Big 5—conscientiousness, extraversion, emotional stability, openness to experience, and agreeableness. We used these terms, along with other descriptors (e.g., neuroticism, introversion) and the terms "Big 5" and "personality" as keywords to identify potential studies for inclusion. In order to be included in our analyses, a study had to focus on employees' personality, which meant we excluded those studies examining the influence of customers' personality on employees from results described later. We also excluded customized versions of these traits (e.g., openness to change) and macro-focused personality studies (e.g., CEO/executive personality).

Leader–member exchange (LMX). The terms "exchange," "negotiation latitude," "vertical dyad," "leader–member," "LMX," "LMX-MDM," "LMSX," and "reciprocity" were used as keywords to identify potential studies for inclusion. We excluded from analyses those studies that

focused on general social exchanges with organizations or coworkers (e.g., Song, Tsui, & Law, 2009).

Organizational justice. "Justice," "injustice," "equity," and "fairness" were used to identify potential studies for inclusion. Whereas we included all forms of organizational justice (i.e., distributive, procedural, interpersonal, interactional, informational), we excluded those studies focused exclusively on how customers treated focal employees from results described later.

Affect. Although there are differences regarding their conceptualization, intensity, focus, and measurement (Elfenbein, 2007), we combined affect, emotion, and mood into one category for the purposes of our review (referred to from this point forward as affect). Thus, we conducted keywords searches using each of these terms in addition to the term "affectivity" to locate relevant studies. We excluded studies focused exclusively on customer emotions and/or partner/spousal emotions.

Coding of Control Variable Justifications

We implemented a coding process following best-practice recommendations offered by Duriau, Reger, and Pfaffer (2007). Specifically, we selected categories for control variable justifications based on an in-depth analysis of the 580 identified studies. This analysis, which consisted of reading each justification given for the more than 3,500 controls contained in our review, revealed six commonly utilized justifications including (a) previous research includes such factors as controls, (b) an anticipated relationship between the control variable and a study's focal variable, (c) a previously found relationship between the control variable and a study's focal variable,[2] (d) a desire to eliminate alternative

[2]Although the two categories coded *anticipated relationships* and *previously found relationships* seemingly share the same underlying principle (i.e., the authors expect a relationship between study variables and control variables), the manner in which authors describe these relationships is typically unique. For example, in some studies, authors simply note there is an expected relationship (e.g., "Because we were concerned that helping behavior would be correlated with how long members had worked in their groups with their leaders") while in other studies authors explicitly note prior findings (e.g., "In addition to our theoretically derived control variables, we also considered several demographic characteristics . . . that have been shown to relate to job performance"). Many of these rationales were clear cut, but approximately 5% of studies included a rationale that was less orthogonal (e.g., "Our dependent variables can also be a function of perceived organizational fairness, alternative employment, and having ideas for improvement"). In such cases, we attempted to glean the primary rationale, erring on the side of anticipated relationships. Less than .5% of total controls were coded as both *anticipated relationships* and *previously found relationships*. All rationales included in these two categories were coded by two individuals. Initial agreement was over 90%, with all discrepancies resolved through discussion.

explanations,[3] (e) establishing incremental or discriminant validity, and (f) an analysis of the study's own data (e.g., the control correlated with a focal variable, differences found between groups of participants).

In addition to the aforementioned six types of justifications, a small number of researchers appeared to use a process for deciding whether or not to include or exclude certain controls (e.g., an examination of theory combined with an analysis of their data characteristics). As such, we also coded for whether a study used at least a two-step process for control variable inclusion or exclusion. Moreover, to ensure the completeness of our review and allow for an exploration into how control variable usage may have evolved over the last decade, we also coded for three categories included in previous explorations into controls variables, namely whether or not (a) a study gave any type of justification (i.e., vs. no justification), (b) a study's justification included a citation or source, and (c) the justification was theoretical in nature (vs. nontheoretical). In coding for a theoretical justification, we relied on the work of Sutton and Staw (1995) and Bacharach (1989) to define what it means to give a theoretical justification. Specifically, we coded a justification as theoretical in nature if the authors attempted to describe the *what*, the *how*, and the *why* between controls and focal variables. Examples of each of these categories are included in Table 1. Finally, we also coded several more basic study features including whether the correlation between the control and focal variable was reported; if reported, whether the relationship was significant; the year in which the study was published; the focal variable's role in the study (i.e., predictor, criterion, moderator, or mediator); the journal name; and the total number of justifications.[4]

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[3]The category coded *eliminate alternative explanations* was originally coded into two separate categories, one labeled *eliminate alternative explanations* and one labeled *spurious relationships*. Contained within the *eliminate alternative explanations* category were those studies explicitly stating that their goal was to eliminate alternative explanations and those studies stating a desire to provide a conservative, robust, or rigorous test of study hypotheses. Contained within the *spurious relationship* category were those studies explicitly mentioning spurious or confounding relationships as well as third-variable and common method effects. Although some justifications could be easily bifurcated into one or the other category, many blurred the line. Rather than having nonorthogonal categories that could lead to erroneous conclusions, we ultimately decided to combine these various justifications into one category. The approximate percentages of studies that could be classified uniquely as spurious was 39%, as rigorous or conservative tests was 11%, as explicitly eliminate alternative explanations was 31%, and as a mixture across those three areas was 19%.

[4]In some studies, authors offered a justification that did not explicitly reference the isolated domain; instead, they referenced the relationship between a control and another focal domain in their study. We included such controls in our results because it was impossible to ascertain if that was the only reason the primary author(s) included the variable and because the control was included in analysis of the isolated domain. Results are equivalent with or without such controls.

TABLE 1
Control Variable Justification Categories, Coding, and Examples

Justification	Coding	Examples
Justification	0 = no justification given	"We included gender and age as controls in all analyses." Coded as 0. Source: Available from authors.
	1 = some justification given	"In hypotheses testing, we also controlled for five demographic variables: gender (1 = female, 2 = male), age (in years), education, and position and organizational tenure (in months)." Coded as 0. Source: Available from authors.
Provides a citation for inclusion	0 = no citation given	"We controlled for age, gender (1 = female), and tenure (measured by number of years in the organization) because they may account for variation in job performance (e.g., Siders, George, & Dharwadkar, 2001)." Coded as 1. Source: Available from authors.
	1 = citation given	
Previously used as control	0 = does not mention previous research as a reason for inclusion	"We also considered organizational tenure and tenure within a store in months as potential control variables because tenure is often controlled in studies of withdrawal (Cotton & Tuttle, 1986)." Coded as 1. Source: Available from authors.
	1 = cites previous research that has used it as a control as a reason	"Control measures included . . . , which are typically included in OCB research (LePine et al., 2002)." Coded as 1. Source: Available from authors.
Anticipated relationships	0 = does not cite a potential relationship with a study variable as a reason	"In these multilevel regression models, the number of hours worked and the number of children living at home were included as control variables, given their potential effect on these outcomes." Coded as 1. Source: Available from authors.
	1 = cites a potential relationship with a study variable as a reason	"Because the work outcomes may vary by sex and race, we controlled for these variables." Coded as 1. Source: Available from authors.
		"Because one's organizational level can impact sensitivity to fairness issues (Schminke et al., 2002), we included . . . " Coded as 1. Source: Available from authors.

Continued

TABLE 1 (continued)

Justification	Coding	Examples
Previously found relationships	0 = does not cite a previously found relationship with a study variable as a reason	"Research has shown job and organizational tenure to be significant factors in predicting voluntary developmental activities and subsequent turnover (Griffeth et al., 2000; Kozlowski & Hults, 1987; Noe & Wilk, 1993)." Coded as 1. Source: Available from authors.
	1 = cites a previously found relationship with a study variable as a reason	"Research has demonstrated unionized employees have different levels of commitment (Hammer & Avgar, 2005) and turnover (Freeman, 1980)." Coded as 1. Source: Available from authors.
Incremental/ discriminant validity	0 = does not mention incremental/discriminant validity as a reason	"Finally, there are two reasons why it may be important to consider whether narcissism adds to the prediction of leadership ratings and job performance over and above the Big 5 traits. First, the Big 5 traits are thought to constitute the majority of the domain of personality, and several Big 5 traits predict leadership (Judge et al., 2002) and performance (Barrick & Mount, 1991) ratings. Second, narcissism itself is related to some of the Big 5 traits, so there is the question of concept redundancy. Specifically, narcissism correlates with extraversion positively, and agreeableness and neuroticism negatively, though these correlations are not especially strong (Graziano & Tobin, 2001). Moreover, the trait that is the best Big 5 predictor of job performance, and one of the best predictors of leadership (i.e., conscientiousness), is generally unrelated to narcissism (Ruiz, Smith, & Rhodewalt, 2001). For these reasons, we expect that controlling for the Big 5 will not undermine the effect of narcissism. Nevertheless, we do control for the Big 5 traits in the analyses." Coded as 1. Source: Available from authors.
	1 = describes incremental/discriminant validity as a reason	"We included the following individual-level control variables so we can be more confident about the unique contribution of dissimilarities on employee attitudes and deviance: . . . " Coded as 1. Source: Available from authors. "To isolate the effects of political skill on performance ratings, this study controlled for the effects of . . . " Coded as 1. Source: Available from authors.

continued

TABLE 1 (continued)

Justification	Coding	Examples
Eliminate alternative explanations	0 = does not mention elimination of alternative explanations	"We controlled for . . . to avoid potential confounding effects on our dependent variables (Van Dyne & LePine, 1998)." Coded as 1. Source: Available from authors.
	1 = mentions elimination of alternative explanations	". . . Therefore, to assess the causal relationships between our key variables and to eliminate alternative explanations, when testing our hypotheses we also controlled for . . . " Coded as 1. Source: Available from authors.
		"To avoid the interpretation that findings could be attributed to tenure in the organization rather than to the evolution of the employee–employer relationships, we controlled for this variable in all analyses." Coded as 1. Source: Available from authors.
Theoretical explanation	0 = does not attempt to explain how and why the control relates to a study variable	"Human capital has been recognized as an important resource that drives employees' contributions to the organization, and empirical evidence has provided support for the link between human capital and unit performance (e.g., Takeuchi et al., 2007). In the service context, the level of employees' customer knowledge is an important indicator of the employees' service human capital. To successfully interact with different types of customers and to help each other, customer-contact employees should have rich knowledge about customer characteristics and various strategies for meeting the diverse needs of different customers (Bettencourt, Gwinner, & Meuter, 2001; Sujan, Sujan, & Bettman, 1988; Weitz, Sujan, & Sujan, 1986). Therefore, employees' customer knowledge may affect their performance by influencing their ability to serve customers and help coworkers. Therefore, we control for the effects of customer knowledge on collective service performance and collective helping behavior to assess how organizational climates can influence employee behaviors beyond the effect of human capital." Coded as 1. Source: Chuang & Liao (2010, pp. 170–171).
	1 = attempts to explain how and why the control relates to a study variable	

continued

TABLE 1 (continued)

Justification	Coding	Examples
		"We controlled for job performance and technical levels, as the turnover literature highlights that competent and experienced employees have more alternative job opportunities and thus are more likely to quit their current jobs (Holtom et al., 2008)." Coded as 1. Source: Liu, Zhang, Wang, and Lee (2011, p. 1309). "We controlled for ... the effect of workload on emotional exhaustion. It has been frequently demonstrated that workload is associated with higher levels of stress, emotional exhaustion, and dissatisfaction at work (Spector & Jex, 1998). A heavy workload leads to these negative consequences partially because of the pressure and responsibility attendant on those with such workloads." Coded as 1. Source: Kammeyer-Mueller, Simon, & Rich (2012, p. 792).
Data analysis	0 = does not use analysis of study data to determine control variable inclusion/exclusion 1 = uses analysis of study data to determine control variable inclusion/exclusion	"Because the groups differed on these potentially confouding variables, tenure and employment status were controlled for in the main analyses." Coded as 1. Source: Available from authors. "As shown in this table, few demographic variables were related to endogenous variables in the model. However, because subordinate age was positively related to LMX ratings, we controlled for the effects of age on LMX ratings in our model tests." Coded as 1. Source: Available from authors. "... because subordinate age was positively correlated with LMX ratings, we controlled ..." Coded as 1. Source: Available from authors.
Process	0 = does not describe (at a minimum) a two-step process for control variable inclusion/exclusion	"In general, these variables were not significantly correlated with our dependent variables. As there was neither strong theory nor previous empirical research suggesting their inclusion, we excluded them from the analysis reported here. However, the same pattern of results is found if these variables are included." Coded as 1. Source: Available from authors.

continued

TABLE 1 (continued)

Justification	Coding	Examples
	1 = describes (at a minimum) a two-step process approach to control variable inclusion/exclusion	"We identified several potentially relevant control variables. For example, gender and age have been shown to relate to executive relationship formation (Lyness & Thompson, 2000). Research has shown that transferees and new hires may differ (e.g., Kramer, Callister, & Turban, 1995). Therefore, age, gender, and new executive status (i.e., new hire or transferee) were all gathered from company records. . . . In addition, research has shown that the amount of interaction between subordinates and superiors is sometimes related to LMX (Schiemann, 1977). Therefore, we asked new executives to report on the number of hours per week (on average) that they interacted with their superior at Time 2. . . . To examine the potential influence of control variables, we examined the correlation matrix. As shown in Table 1, age and gender were correlated with extraversion such that older executives were less extraverted than younger ones and that women were more extraverted than men. In addition, gender was positively related to LMX quality, with men reporting stronger relationships, and it was negatively correlated with turnover intentions, with men reporting lower intentions than women. Finally, number of hours of interaction was positively correlated with LMX. Therefore, we controlled for age, gender, and hours of interaction in all analyses, but we did not control for employee status because it was unrelated to our variables of interest." Coded as 1. Source: Available from authors.
		". . . although the anticipatory socialization stage is not a focus of this research, the literature suggests that newcomer preentry experiences can influence socialization processes and outcomes. For example, newcomers with previous experience in the

Continued

TABLE 1 (continued)

Justification	Coding	Examples
		same industry should experience less reality shock and have an easier time adjusting (Feldman, 1994; Louis, 1980). Demographic characteristics may also represent life experiences relevant to the socialization process (Bauer et al., 1998). For example, education may be related to skills at the time of hiring, whereas age may be related to career stage (Feldman, 1989). Race has been shown to play a role in network building (Mollica, Gray, & Trevino, 2003). Therefore, I assessed previous industry experience, age, education, race, and sex as potential control variables. Age, education, and sex were unrelated to study variables and so were excluded from further analysis. Previous industry experience and race were related to several socialization tactics and so were included in all analyses." Coded as 1. Source: Available from authors.
Total number of justifications[a]		

Note. All examples given in this table are direct quotations from studies included in this review. Citation information is given for those studies offering a theoretical justification because these authors deserve acknowledgement for their efforts; citation information is not listed for other justifications because our goal was to draw light on current practices and not criticize specific individual work. This information is, however, available from the first author upon request.

[a]We also coded the total number of justifications offered for each specific control variable. Neither theoretical justifications nor process justifications are included as independent justifications.

Interrater Agreement

Prior to including or excluding any "questionable" study (e.g., a macro-oriented study or a Time 1 control of a Time 2 focal variable), the first author obtained an independent inclusion/exclusion rating from an advanced doctoral student in a management PhD program. The only prior information the second coder received was the "method" section of this review. Initial agreement was 96%, and discrepancies were discussed until consensus was reached on those studies originally rated differently. Moreover, to check on the completeness and accuracy of the coding categories, category descriptions (see Table 1) and 200 randomly selected control variable justifications were given to the same second coder. Agreement was over 89% for each of 11 categories with an overall average agreement of 96%. The first author proceeded coding the remainder of the dataset only after discrepancies were resolved through discussion.

Results

What Controls Are Included

The 10 focal research domains we examined in this study have very different theoretical bases, yet results summarized in Table 2 uncover unexpected commonalities across the statistical controls used in the study of each of these domains. Specifically, gender-related controls were the most frequently used statistical controls found in all but one research domain (and in that domain, it was the second most common). The frequency of inclusion ranged from a low of 54% of turnover studies to a high of 73% of LMX studies. The second and third most popular statistical controls also showed consistency throughout research domains with tenure- and age-related controls serving as either the second or third most frequently used statistical control, respectively. In terms of tenure-related controls, the overall frequency ranged from a low of 28% of personality studies to a high of 78% of LMX studies. The specific breakdown of tenure-related controls varied from topic to topic but most frequently took shape in the form of either job or organizational tenure. Other forms of tenure, seen more frequently within the study of task performance and LMX, included team tenure and dyadic tenure. When tenure-related controls were not the second most commonly included control, age-related controls were for the remaining research domains. Individual inclusion rates ranged from 39% of personality studies to 65% of LMX studies

with an average inclusion rate of approximately 50% across all research domains.

After gender-, tenure-, and age-related controls, the next most frequently used statistical controls were a combination of four variables including education-related controls, race-related controls, personality, and organization/group size. As seen in Table 2, the fourth most commonly used statistical controls employed in the study of OCBs ($n = 23$, 21%), satisfaction ($n = 25$, 23%), commitment ($n = 26$, 30%), LMX ($n = 15$, 31%), and organizational justice ($n = 27$, 26%) were education-related factors. Organization/group size was the fourth most commonly used in the study of task performance ($n = 64$, 29%) and turnover ($n = 27$, 28%). Personality traits were the fourth most common used control in the study of burnout ($n = 11$, 35%) and affect ($n = 17$, 23%), and race-related controls were the fourth most common statistical control used in the study of personality ($n = 14$, 21%). When not fourth in order of frequency, education-related controls, organization/group size, personality, and race-related controls were in the top 10 most commonly used statistical controls for virtually all 10 focal domains (specific placement varied slightly, see Table 2). In terms of personality controls, Table 2 reveals seven personality traits frequently serve as statistical controls, namely, positive and negative affect and traits of the Big Five.

Besides common demographic (e.g., gender, age, tenure) and personality (e.g., positive affect, negative affect) variables, the convergence of what is controlled for across domains declined rapidly. Factors such as work experience, workload/hours worked, family-related concerns, and industry were seen in studies across research domains, although their frequency varied from topic to topic. Other variables, appearing in only a select number of research domains, include income-related controls, job satisfaction, LMX, and organizational justice. In fact, in addition to the similarities described, some interesting distinctions are also apparent in Table 2. For example, factors more prominent in the study of turnover than in other areas included income-related factors, local unemployment characteristics, and job embeddedness. Factors seen relatively more frequently in the study of LMX than in other areas included dyadic tenure and demographic differences, and those contained more frequently in job satisfaction and burnout than in other substantive domains included positive and negative affect. Moreover, task performance included a wider array of controls such as autonomy and trust, which are factors not used in many of the other areas.

TABLE 2
Control Variables Used in Popular OB/HRM and Applied Psychology Research Domains

Control category	Specific control		Research domain: Performance	OCBs	Turnover	Job satisfaction	Commitment	Burnout	Personality[c]	LMX	Justice[d]	Affect[e]
Gender		# Studies	134	71	53	73	56	21	37	36	67	41
		Percent	61%	63%	54%	68%	65%	68%	55%	73%	65%	55%
		Significant effect sizes[a]	20% (29/145)	12% (10/81)	18% (11/60)	14% (11/80)	12% (8/67)	17% (5/29)	27% (20/73)	15% (6/39)	20% (19/96)	14% (10/71)
		# of *r*s not reported[b]	31	36	11	16	14	3	13	11	44	6
	Employee	# Studies	112	68	48	68	53	20	35	29	61	40
		Percent	51%	61%	49%	64%	62%	65%	52%	59%	59%	53%
		Significant effect sizes[a]	22% (24/110)	14% (10/70)	16% (8/50)	14% (11/77)	11% (7/62)	14% (4/28)	28% (18/64)	16% (4/25)	23% (18/80)	15% (10/68)
		# of *r*s not reported[b]	24	28	11	10	10	3	13	7	28	5
	Manager	# Studies	13	6	3	1	4	1	1	8	4	1
		Percent	6%	5%	3%	1%	5%	3%	1%	16%	4%	1%
		Significant effect sizes[a]	0% (0/11)	0% (0/5)	0% (0/3)	-	0% (0/3)	100% (1/1)	50% (2/4)	0% (0/6)	0% (0/6)	-
		# of *r*s not reported[b]	3	3	-	1	1	-	-	2	5	1
	Gender differences	# Studies	16	5	1	6	3	-	2	10	6	2
		Percent	7%	4%	1%	6%	3%	-	3%	20%	6%	3%
		Significant effect sizes[a]	11% (2/18)	0% (0/4)	0% (0/1)	0% (0/3)	0% (0/1)	-	0% (0/5)	25% (2/8)	11% (1/9)	0% (0/3)
		# of *r*s not reported[b]	-	3	-	4	2	-	-	2	11	-
	Other gender-related controls	# Studies	8	3	5	1	2	-	-	-	1	-
		Percent	4%	3%	5%	1%	2%	-	-	-	1%	-
		Significant effect sizes[a]	50% (3/6)	0% (0/2)	50% (3/6)	-	100% (1/1)	-	-	-	0% (0/1)	-
		# of *r*s not reported[b]	4	2	-	1	1	-	-	-	-	-
Tenure		# Studies	129	65	41	48	42	12	19	38	44	25
		Percent	59%	58%	42%	45%	49%	39%	28%	78%	43%	33%
		Significant effect sizes[a]	28% (51/183)	22% (24/111)	38% (18/47)	29% (17/58)	40% (26/65)	50% (14/28)	17% (7/42)	19% (9/47)	20% (18/91)	8% (3/39)

Continued

TABLE 2 (Continued)

Control category	Specific control		Research domain: Performance	OCBs	Turnover	Job satisfaction	Commitment	Burnout	Personality[c]	LMX	Justice[d]	Affect[e]
		# of *r*s not reported[b]	32	32	11	12	15	-	7	19	35	5
	Job	# Studies	24	17	1	5	2	4	3	3	12	8
		Percent	11%	15%	1%	5%	2%	13%	4%	6%	12%	11%
		Significant effect sizes[a]	24% (7/29)	13% (3/23)	0% (0/1)	38% (3/8)	0% (0/2)	20% (1/5)	33% (4/12)	67% (2/3)	0% (0/12)	14% (1/7)
		# of *r*s not reported[b]	4	4	-	1	-	-	-	-	4	3
	Organizational	# Studies	84	49	37	36	37	7	13	25	33	17
		Percent	39%	44%	38%	34%	43%	23%	19%	51%	32%	23%
		Significant effect sizes[a]	32% (28/87)	28% (16/58)	43% (16/37)	28% (11/40)	44% (23/52)	59% (13/22)	10% (2/20)	5% (1/19)	29% (14/49)	7% (2/28)
		# of *r*s not reported[b]	17	15	11	8	10	-	7	9	17	1
	Group/team	# Studies	19	4	1	4	-	-	-	4	-	1
		Percent	9%	4%	1%	4%	-	-	-	8%	-	1%
		Significant effect sizes[a]	26% (7/27)	29% (2/7)	0% (0/1)	40% (2/5)	-	-	-	60% (3/5)	-	0% (0/1)
		# of *r*s not reported[b]	-	-	-	-	-	-	-	1	-	-
	Dyadic/tenure under manager	# Studies	21	14	1	3	3	1	2	18	10	3
		Percent	10%	13%	1%	3%	3%	3%	3%	37%	10%	4%
		Significant effect sizes[a]	16% (3/19)	8% (1/13)	100% (1/1)	33% (1/3)	0% (0/1)	0% (0/1)	0% (0/2)	13% (2/15)	8% (1/13)	0% (0/2)
		# of *r*s not reported[b]	5	8	-	-	2	-	-	4	5	1
	Tenure diversity	# Studies	6	1	2	2	1	-	1	1	1	-
		Percent	3%	1%	2%	2%	1%	-	1%	2%	1%	-
		Significant effect sizes[a]	29% (2/7)	-	0% (0/2)	0% (0/1)	-	-	25% (1/4)	0% (0/1)	0% (0/3)	-
		# of *r*s not reported[b]	-	1	-	1	1	-	-	-	3	-

Continued

TABLE 2 (Continued)

Control category	Specific control		Research domain									
			Performance	OCBs	Turnover	Job satisfaction	Commitment	Burnout	Personality[c]	LMX	Justice[d]	Affect[e]
	Manager's tenure[f]	# Studies	9	6	3	1	4	-	1	5	5	-
		Percent	4%	5%	3%	1%	5%	-	1%	10%	5%	-
		Significant effect sizes[a]	22% (2/9)	25% (2/8)	0% (0/3)	-	0% (0/3)	-	0% (0/4)	33% (1/3)	15% (2/13)	-
		# of *r*s not reported[b]	2	1	-	1	1	-	-	2	4	-
	Other tenure-related controls	# Studies	8	5	2	2	3	-	-	3	2	1
		Percent	4%	4%	2%	2%	3%	-	-	6%	2%	1%
		Significant effect sizes[a]	40% (2/5)	0% (0/2)	50% (1/2)	0% (0/1)	43% (3/7)	-	-	0% (0/1)	100% (1/1)	0% (0/1)
		# of *r*s not reported[b]	4	3	-	1	1	-	-	3	2	-
Age		# Studies	118	56	45	59	42	18	26	32	59	37
		Percent	54%	50%	46%	55%	49%	58%	39%	65%	57%	49%
		Significant effect sizes[a]	24% (31/128)	22% (16/73)	48% (22/46)	21% (15/70)	44% (18/41)	28% (7/25)	26% (10/39)	29% (9/31)	15% (12/78)	6% (4/65)
		# of *r*s not reported[b]	29	24	12	7	11	3	8	13	35	8
	Employee	# Studies	98	54	40	56	37	18	24	26	54	36
		Percent	45%	48%	41%	52%	43%	58%	36%	53%	52%	48%
		Significant effect sizes[a]	26% (24/94)	19% (12/62)	50% (19/38)	22% (15/67)	57% (17/30)	28% (7/25)	26% (10/38)	23% (5/22)	16% (11/70)	6% (4/63)
		# of *r*s not reported[b]	20	21	11	7	10	3	7	7	26	7
	Manager	# Studies	10	6	1	-	4	-	-	6	3	1
		Percent	5%	5%	1%	-	5%	-	-	12%	3%	1%
		Significant effect sizes[a]	38% (3/8)	43% (3/7)	0% (0/1)	-	0% (0/5)	-	-	50% (2/4)	0% (0/4)	-
		# of *r*s not reported[b]	3	3	-	-	-	-	-	2	1	1
	Differences	# Studies	14	-	2	3	2	-	2	8	3	1
		Percent	6%	-	2%	3%	2%	-	3%	16%	3%	1%
		Significant effect sizes[a]	13% (2/15)	-	0% (0/1)	0% (0/3)	0% (0/2)	-	0% (0/1)	40% (2/5)	0% (0/2)	0% (0/2)
		# of *r*s not reported[b]	1	-	1	-	-	-	1	4	8	-

Continued

TABLE 2 (Continued)

Control category	Specific control		Research domain									
			Performance	OCBs	Turnover	Job satisfaction	Commitment	Burnout	Personality[c]	LMX	Justice[d]	Affect[e]
	Organizational/ team	# Studies	8	2	4	-	3	-	-	-	1	-
		Percent	4%	2%	4%	-	3%	-	-	-	1%	-
		Significant effect sizes[a]	22% (2/9)	0% (0/2)	40% (2/5)	-	0% (0/3)	-	-	-	100% (1/1)	-
		# of *r*s not reported[b]	-	-	-	-	-	-	-	-	-	-
	Other age-related controls	# Studies	5	1	1	-	2	-	-	-	1	-
		Percent	2%	1%	1%	-	2%	-	-	-	1%	-
		Significant effect sizes[a]	0% (0/2)	50% (1/2)	100% (1/1)	-	100% (1/1)	-	-	-	0% (0/1)	-
		# of *r*s not reported[b]	5	-	-	-	1	-	-	-	-	-
Education		# Studies	44	23	20	25	26	4	6	15	27	10
		Percent	20%	21%	20%	23%	30%	13%	9%	31%	26%	13%
		Significant effect sizes[a]	19% (9/48)	14% (3/21)	46% (13/28)	42% (10/24)	52% (13/25)	25% (1/4)	57% (4/7)	13% (2/16)	24% (7/29)	11% (1/9)
		# of *r*s not reported[b]	13	14	2	3	6	1	1	8	11	6
	Employee	# Studies	38	23	20	23	25	4	6	13	27	10
		Percent	17%	21%	20%	21%	29%	13%	9%	27%	26%	13%
		Significant effect sizes[a]	22% (8/36)	15% (3/20)	46% (13/28)	45% (10/22)	57% (13/23)	25% (1/4)	57% (4/7)	17% (2/12)	24% (7/29)	11% (1/9)
		# of *r*s not reported[b]	11	12	2	3	6	1	1	4	10	6
	Manager	# Studies	5	2	-	-	1	-	-	5	1	-

Continued

TABLE 2 (Continued)

Control category	Specific control		Research domain									
			Performance	OCBs	Turnover	Job satisfaction	Commitment	Burnout	Personality[c]	LMX	Justice[d]	Affect[e]
		Percent	2%	2%	-	-	1%	-	-	10%	1%	-
		Significant effect sizes[a]	20% (1/5)	0% (0/1)	-	-	0% (0/1)	-	-	0% (0/3)	-	-
		# of *r*s not reported[b]	1	1	-	-	-	-	-	2	1	-
	Educational differences	# Studies	8	-	-	2	1	-	-	3	-	-
		Percent	4%	-	-	2%	1%	-	-	6%	-	-
		Significant effect sizes[a]	0% (0/7)	-	-	0% (0/2)	0% (0/1)	-	-	0% (0/1)	-	-
		# of *r*s not reported[b]	1	-	-	-	-	-	-	2	-	-
	Other education-related controls	# Studies	-	1	-	-	-	-	-	-	-	-
		Percent	-	1%	-	-	-	-	-	-	-	-
		Significant effect sizes[a]	-	-	-	-	-	-	-	-	-	-
		# of *r*s not reported[b]	-	1	-	-	-	-	-	-	-	-
Race		# Studies	33	20	21	24	21	4	14	8	11	7
		Percent	15%	18%	21%	22%	24%	13%	21%	16%	11%	9%
		Significant effect sizes[a]	18% (7/40)	13% (3/23)	32% (8/25)	27% (6/22)	27% (4/15)	17% (1/6)	4% (3/71)	0% (0/5)	8% (4/52)	13% (1/8)
		# of *r*s not reported[b]	6	8	3	10	10	1	6	4	9	4
	Employee	# Studies	27	17	21	21	20	4	12	3	10	7
		Percent	12%	15%	21%	20%	23%	13%	18%	6%	10%	9%
		Significant effect sizes[a]	13% (4/30)	11% (2/19)	35% (8/23)	29% (6/21)	29% (4/14)	17% (1/6)	5% (3/63)	0% (0/1)	7% (3/43)	13% (1/8)
		# of *r*s not reported[b]	4	7	3	6	7	1	5	2	3	4

Continued

TABLE 2 (Continued)

Control category	Specific control		Research domain									
			Performance	OCBs	Turnover	Job satisfaction	Commitment	Burnout	Personality[c]	LMX	Justice[d]	Affect[e]
	Manager	# Studies	1	1	1	1	2	-	1	-	2	-
		Percent	0%	1%	1%	1%	2%	-	1%	-	2%	-
		Significant effect sizes[a]	0% (0/1)	0% (0/1)	0% (0/1)	-	0% (0/1)	-	0% (0/4)	-	0% (0/6)	-
		# of *r*s not reported[b]	-	-	-	1	1	-	-	-	3	-
	Racial differences	# Studies	7	4	1	3	1	-	2	6	1	-
		Percent	3%	4%	1%	3%	1%	-	3%	12%	1%	-
		Significant effect sizes[a]	14% (1/7)	33% (1/3)	0% (0/1)	0% (0/1)	-	-	0% (0/4)	0% (0/4)	33% (1/3)	-
		# of *r*s not reported[b]	-	1	-	3	1	-	1	2	3	-
	Other	# Studies	2	-	-	-	1	-	-	-	-	-
		Percent	1%	-	-	-	1%	-	-	-	-	-
		Significant effect sizes[a]	100% (2/2)	-	-	-	-	-	-	-	-	-
		# of *r*s not reported[b]	2	-	-	-	1	-	-	-	-	-
Organization/ group size		# Studies	64	18	27	21	19	2	3	12	13	3
		Percent	29%	16%	28%	20%	22%	6%	4%	24%	13%	4%
		Significant effect sizes[a]	19% (14/73)	11% (2/19)	42% (16/38)	35% (6/17)	44% (11/25)	67% (2/3)	0% (0/6)	25% (2/8)	26% (5/19)	50% (1/2)
		# of *r*s not reported[b]	7	7	8	9	6	-	-	6	12	1
Personality		# Studies	36	22	9	23	3	11	4[c]	3	19	17[e]
		Percent	17%	20%	9%	21%	3%	35%	-	6%	18%	23%
		Significant effect sizes[a]	45% (40/88)	60% (51/85)	62% (16/26)	67% (42/63)	83% (5/6)	91% (20/22)	67% (4/6)	67% (4/6)	48% (26/54)	57% (34/60)
		# of *r*s not reported[b]	16	11	1	10	-	1	2	3	6	-

Continued

TABLE 2 (Continued)

Control category	Specific control		Research domain									
			Performance	OCBs	Turnover	Job satisfaction	Commitment	Burnout	Personality[c]	LMX	Justice[d]	Affect[e]
	Agreeableness	# Studies	10	7	1	1	-	-	[c]	-	1	-
		Percent	5%	6%	1%	1%	-	-	[c]	-	1%	-
		Significant effect sizes[a]	44% (7/16)	70% (7/10)	100% (1/1)	-	-	-	[c]	-	90% (9/10)	-
		# of *r*s not reported[b]	2	2	-	1	-	-	[c]	-	-	-
	Conscientiousness	# Studies	13	9	3	2	1	-	[c]	-	-	2
		Percent	6%	8%	3%	2%	1%	-	[c]	-	-	3%
		Significant effect sizes[a]	50% (6/12)	62% (8/13)	50% (2/4)	100% (2/2)	0% (0/1)	-	[c]	-	-	67% (2/3)
		# of *r*s not reported[b]	3	2	-	2	-	-	[c]	-	-	-
	Emotional stability	# Studies	11	8	2	3	-	1	[c]	-	3	3
		Percent	5%	7%	2%	3%	-	3%	[c]	-	3%	4%
		Significant effect sizes[a]	6% (1/17)	33% (4/12)	100% (3/3)	67% (2/3)	-	-	[c]	-	14% (2/14)	17% (1/6)
		# of *r*s not reported[b]	3	2	-	2	-	1	[c]	-	-	-
	Extraversion	# Studies	9	7	2	2	-	-	[c]	-	-	4
		Percent	4%	6%	2%	2%	-	-	[c]	-	-	5%
		Significant effect sizes[a]	50% (4/8)	73% (8/11)	100% (2/2)	100% (1/1)	-	-	[c]	-	-	43% (3/7)
		# of *r*s not reported[b]	3	2	-	2	-	-	[c]	-	-	-
	Openness	# Studies	10	7	2	2	-	-	[c]	-	-	-
		Percent	5%	6%	2%	2%	-	-	[c]	-	-	-
		Significant effect sizes[a]	25% (2/8)	60% (6/10)	50% (1/2)	0% (0/1)	-	-	[c]	-	-	-
		# of *r*s not reported[b]	2	2	-	1	-	-	[c]	-	-	-

Continued

TABLE 2 (Continued)

Control category	Specific control		Research domain									
			Performance	OCBs	Turnover	Job satisfaction	Commitment	Burnout	Personality[c]	LMX	Justice[d]	Affect[e]
	Positive affect	# Studies	8	8	4	14	-	4	1	3	6	[e]
		Percent	4%	7%	4%	13%	-	13%	1%	6%	6%	[e]
		Significant effect sizes[a]	57% (4/7)	73% (8/11)	25% (1/4)	62% (13/21)	-	80% (4/5)	-	100% (3/3)	58% (7/12)	[e]
		# of *r*s not reported[b]	1	-	-	-	-	-	1	-	1	[e]
	Negative affect	# Studies	12	10	5	17	3	10	3	3	8	[e]
		Percent	6%	9%	5%	16%	3%	32%	4%	6%	8%	[e]
		Significant effect sizes[a]	83% (10/12)	43% (6/14)	50% (3/6)	80% (20/25)	100% (5/5)	94% (15/16)	60% (3/5)	33% (1/3)	44% (4/9)	[e]
		# of *r*s not reported[b]	2	1	-	1	-	-	1	-	5	[e]
	Other personality traits	# Studies	5	3	3	4	-	1	1	1	5	11
		Percent	2%	3%	3%	4%	-	3%	1%	2%	5%	15%
		Significant effect sizes[a]	86% (6/7)	100% (4/4)	75% (3/4)	40% (4/10)	-	100% (1/1)	100% (1/1)	-	44% (4/9)	64% (28/44)
		# of *r*s not reported[b]	-	-	1	1	-	-	-	3	-	-
Work experience		# Studies	19	13	11	12	5	1	6	4	7	6
		Percent	9%	12%	11%	11%	6%	3%	9%	8%	7%	8%
		Significant effect sizes[a]	17% (3/18)	7% (1/14)	30% (3/10)	23% (3/13)	43% (3/7)	-	25% (2/8)	0% (0/4)	0% (0/5)	18% (2/11)
		# of *r*s not reported[b]	3	2	2	2	-	6	10	-	3	2

Continued

TABLE 2 (Continued)

Control category	Specific control		Research domain									
			Performance	OCBs	Turnover	Job satisfaction	Commitment	Burnout	Personality[c]	LMX	Justice[d]	Affect[e]
		# Studies	23	14	13	14	7	7	1	5	7	6
Workload/hours worked		Percent	11%	13%	13%	13%	8%	23%	1%	10%	7%	8%
		Significant effect sizes[a]	43% (10/23)	43% (6/14)	23% (3/13)	19% (3/16)	36% (4/11)	25% (4/16)	50% (1/2)	25% (1/4)	25% (2/8)	33% (3/9)
		# of *r*s not reported[b]	2	3	4	1	3	-	-	1	4	2
Industry		# Studies	9	3	7	7	8	-	1	-	2	1
		Percent	4%	3%	7%	7%	9%	-	1%	-	2%	1%
		Significant effect sizes[a]	25% (3/12)	0% (0/1)	33% (6/18)	8% (1/12)	25% (3/12)	-	-	-	-	-
		# of *r*s not reported[b]	4	3	3	5	6	-	2	-	2	1
Income-related controls		# Studies	13	2	17	14	3	-	1	-	10	3
		Percent	6%	2%	17%	13%	3%	-	1%	-	10%	4%
		Significant effect sizes[a]	43% (6/14)	100% (1/1)	60% (18/30)	40% (10/25)	50% (1/2)	-	100% (2/2)	-	57% (8/14)	75% (6/8)
		# of *r*s not reported[b]	3	2	1	1	1	-	-	-	-	-
Family-related controls		# Studies	10	2	9	8	6	2	2	1	3	1
		Percent	5%	2%	9%	7%	7%	6%	3%	2%	3%	1%
		Significant effect sizes[a]	27% (4/15)	0% (0/8)	46% (6/13)	18% (9/50)	0% (0/5)	50% (3/6)	13% (1/8)	-	50% (4/8)	-
		# of *r*s not reported[b]	7	-	3	2	10	-	-	1	5	2
	Marital status	# Studies	8	2	6	4	3	1	1	1	1	1
		Percent	4%	2%	6%	4%	3%	3%	1%	2%	1%	1%
		Significant effect sizes[a]	40% (2/5)	0% (0/4)	71% (5/7)	40% (2/5)	0% (0/1)	0% (0/1)	33% (1/3)	-	-	-
		# of *r*s not reported[b]	4	-	2	1	2	-	-	1	1	1
	Parental status/# of children	# Studies	7	2	6	7	5	2	2	-	1	1

Continued

TABLE 2 (Continued)

Control category	Specific control		Research domain									
			Performance	OCBs	Turnover	Job satisfaction	Commitment	Burnout	Personality[c]	LMX	Justice[d]	Affect[e]
		Percent	3%	2%	6%	7%	6%	6%	3%	-	1%	1%
		Significant effect sizes[a]	29% (2/7)	0% (0/4)	20% (1/5)	25% (4/16)	0% (0/3)	60% (3/5)	0% (0/4)	-	-	-
		# of *r*s not reported[b]	3	-	1	1	2	-	-	-	1	1
	Other family-related controls	# Studies	2	-	1	3	4	-	1	-	2	-
		Percent	1%	-	1%	3%	5%	-	1%	-	2%	-
		Significant effect sizes[a]	0% (0/3)	-	0% (0/1)	10% (3/29)	0% (0/1)	-	0% (0/1)	-	50% (4/8)	-
		# of *r*s not reported[b]	-	-	-	-	6	-	-	-	3	-
Job satisfaction		# Studies	6	8	8	-	5	-	-	1	2	-
		Percent	3%	7%	8%	-	6%	-	-	2%	2%	-
		Significant effect sizes[a]	80% (4/5)	38% (3/8)	73% (8/11)	-	100% (5/5)	-	-	100% (1/1)	100% (9/9)	-
		# of *r*s not reported[b]	1	2	-	-	1	-	-	-	-	-
Autonomy		# Studies	7	-	-	-	-	1	-	-	-	1
		Percent	3%	-	-	-	-	3%	-	-	-	1%
		Significant effect sizes[a]	25% (2/8)	-	-	-	-	100% (1/1)	-	-	-	25% (1/4)
		# of *r*s not reported[b]	-	-	-	-	-	-	-	-	-	-
Commitment		# Studies	6	3	8	1	-	-	-	1	-	2
		Percent	3%	3%	8%	1%	-	-	-	2%	-	3%
		Significant effect sizes[a]	50% (2/4)	75% (3/4)	50% (7/14)	100% (1/1)	-	-	-	100% (1/1)	-	83% (5/6)
		# of *r*s not reported[b]	2	-	-	-	-	-	-	-	-	-
LMX		# Studies	5	5	-	1	1	-	-	-	-	-
		Percent	2%	4%	-	1%	1%	-	-	-	-	-

Continued

TABLE 2 (Continued)

Control category	Specific control		Research domain									
			Performance	OCBs	Turnover	Job satisfaction	Commitment	Burnout	Personality[c]	LMX	Justice[d]	Affect[e]
		Significant effect sizes[a]	50% (2/4)	75% (6/8)	-	100% (1/1)	-	-	-	-	-	-
		# of *r*s not reported[b]	1	-	-	1	1	-	-	-	-	-
Union-status/related controls		# Studies	2	1	6	-	3	-	1	-	4	-
		Percent	1%	1%	6%	-	3%	-	1%	-	4%	-
		Significant effect sizes[a]	50% (1/2)	0% (0/2)	73% (8/11)	-	25% (1/4)	-	0% (0/2)	-	50% (3/6)	-
		# of *r*s not reported[b]	-	-	-	-	-	-	-	-	-	-
Justice		# Studies	1	6	2	3	5	-	-	2	[d]	2
		Percent	0%	5%	2%	3%	6%	-	-	4%	[d]	3%
		Significant effect sizes[a]	100% (1/1)	40% (4/10)	100% (2/2)	63% (5/8)	100% (4/4)	-	-	100% (2/2)	[d]	0% (0/1)
		# of *r*s not reported[b]	-	1	-	1	4	-	-	-	[d]	1
Skills		# Studies	3	-	1	-	-	-	-	2	-	-
		Percent	1%	-	1%	-	-	-	-	4%	-	-
		Significant effect sizes[a]	67% (2/3)	-	0% (0/1)	-	-	-	-	50% (2/4)	-	-
		# of *r*s not reported[b]	-	-	-	-	-	-	-	-	-	-
POS		# Studies	2	1	1	-	-	-	-	3	-	-
		Percent	1%	1%	1%	-	-	-	-	6%	-	-
		Significant effect sizes[a]	67% (2/3)	50% (1/2)	0% (0/1)	-	-	-	-	75% (3/4)	-	-
		# of *r*s not reported[b]	-	-	-	-	-	-	-	-	-	-
Trust		# Studies	4	2	-	-	1	-	-	-	-	-
		Percent	2%	2%	-	-	1%	-	-	-	-	-
		Significant effect sizes[a]	0% (0/3)	100% (1/1)	-	-	100% (1/1)	-	-	-	-	-
		# of *r*s not reported[b]	1	2	-	-	-	-	-	-	-	-

Continued

TABLE 2 (Continued)

Control category	Specific control		Research domain									
			Performance	OCBs	Turnover	Job satisfaction	Commitment	Burnout	Personality[c]	LMX	Justice[d]	Affect[e]
Unemployment-related controls		# Studies	4	-	12	3	3	-	-	-	2	-
		Frequency	2%	-	12%	3%	3%	-	-	-	2%	-
		Significant effect sizes[a]	0% (0/3)	-	60% (6/10)	75% (3/4)	33% (1/3)	-	-	-	50% (1/2)	-
		# of *r*s not reported[b]	3	-	4	-	-	-	-	-	-	-
Embeddedness		# Studies	1	1	6	-	1	-	-	2	2	-
		Percent	0%	1%	6%	-	1%	-	-	4%	2%	-
		Significant effect sizes[a]	0% (0/1)	0% (0/1)	56% (9/16)	-	100% (1/1)	-	-	0% (0/2)	0% (0/2)	-
		# of *r*s not reported[b]	-	-	5	-	-	-	-	-	-	-
Job stress		# Studies	1	1	3	4	1	-	-	-	-	-
		Percent	0%	1%	3%	4%	1%	-	-	-	-	-
		Significant effect sizes[a]	0% (0/1)	0% (0/1)	100% (4/4)	50% (4/8)	100% (1/1)	-	-	-	-	-
		# of *r*s not reported[b]	-	-	-	-	-	-	-	-	-	-
Intelligence		# Studies	1	-	1	2	1	-	4	-	-	2
		Percent	0%	-	1%	2%	1%	-	6%	-	-	3%
		Significant effect sizes[a]	0% (0/1)	-	75% (3/4)	67% (2/3)	50% (1/2)	-	17% (1/6)	-	-	33% (1/3)
		# of *r*s not reported[b]	-	-	-	-	0	-	-	-	-	-
Social desirability		# Studies	2	1	1	1	1	1	-	1	3	3
		Percent	1%	1%	1%	1%	1%	3%	-	2%	3%	4%
		Significant effect sizes[a]	-	-	0% (0/1)	-	-	-	-	0% (0/1)	67% (2/3)	33% (1/3)
		# of *r*s not reported[b]	2	1	-	1	1	3	-	-	-	-
Controls related to sample effects[g]		# Studies	66	36	32	35	34	9	13	13	15	15

Continued

TABLE 2 (Continued)

Control category	Specific control	Research domain										
			Performance	OCBs	Turnover	Job satisfaction	Commitment	Burnout	Personality[c]	LMX	Justice[d]	Affect[e]
Studies using controls not listed above		# Studies	64	30	45	30	23	9	24	11	36	38
Overall totals		580	218	112	98	107	86	31	67	49	103	75

Note. Overall number of unique studies = 580. Total studies including at least one statistical control are as follows: Performance ($n = 218$), OCBs ($n = 112$), turnover ($n = 98$), job satisfaction ($n = 107$), commitment ($n = 86$), burnout ($n = 31$), personality ($n = 67$), LMX ($n = 49$), justice ($n = 103$), and affect ($n = 75$). # Studies = the total number of unique studies including a particular control. Percent = the % of studies within each research domain including that specific control. The numbers listed in this table are not exclusive. That is, several studies using statistical controls investigated more than one research domain simultaneously (e.g., task-performance and OCBs, job satisfaction and organizational commitment). In such cases, the control(s) was counted and listed under both research domains.

[a]The denominator in this row may not always match the number of studies listed in the first row because some studies include multiple measures of the research domain (e.g., different forms of performance, OCBs, turnover, commitment, justice), multiple time periods, other-rated and self-rated measures, different samples within the same study (e.g., men, women, organization 1–3), and/or other study-specific reasons.
[b]The numbers listed in this row include those studies that stated that the control variable had limited influence (but did not report actual correlations). When authors specifically noted a control was statistically nonsignificantly related to the research domain, that effect size was counted as part of the ratio listed under the *Significant effect sizes* row.
[c]This included any study with at least one of the Big 5 personality traits (conscientiousness, agreeableness, emotional stability, openness, and extraversion) as a focal variable. Not shown in this table are those studies ($n = 16$) that controlled for a nonfocal Big 5 trait in the study of a focal Big 5 trait.
[d]Not shown in this table are those studies that controlled for a nonfocal justice facet in the study of a focal justice facet ($n = 13$).
[e]Includes emotions, mood, and dispositional affect. Not shown in this table are those studies controlling for either state or trait positive ($n = 17$) and negative ($n = 21$) affect in the study of either trait or state affect.
[f]The numbers included in this row represent organizational, job, and occupation tenure.
[g]Sample effect controls (typically dummy coded) included such variables as location, organization, and job function, among others.

One factor perhaps surprisingly absent from many of the studies employing statistical controls was social desirability. As seen in Table 2, fewer than 2% of all studies over the last decade included a measure of social desirability as a statistical control. Given previous concerns over methodological biases in data collection (Kuncel & Tellegen, 2009), one might suspect the more frequent use of measures of social desirability.

Table 2 also indicates statistically nonsignificant relationships between many of the selected controls and the focal variable under investigation.[5] In the domain of task performance, for example, the five most frequently used control variables (gender, tenure, age, organization/group size, and education) were not related in more than two-thirds of the studies reporting effect sizes. This pattern was repeated throughout many of the other research domains with few statistically significant relationships found between the most frequently included statistical controls and the focal variable under investigation. There were, however, a handful of controls that related frequently to the focal variable under investigation within each research domain. Specifically, in the study of task performance, factors such as negative affect and job satisfaction were both related in more than 80% of the studies reporting effect sizes. For OCBs, more frequently related factors included agreeableness, extraversion, positive affect, income-related controls, and LMX. For turnover, the relationships between common demographic variables (e.g., age, education) were more frequently related than many of the other focal areas, but perceptual factors such as personality traits and job satisfaction were the most frequently related statistical controls. Other statistical controls fairly unique to the study of turnover, but with frequently significant effect sizes, included income-related controls, local unemployment factors, and job embeddedness. Those factors frequently associated with job satisfaction were mostly personality traits, and in particular negative affect. Moreover, although factors such as employee age and education, job satisfaction, negative affect, and organizational justice frequently relate to organizational commitment, positive and negative affect, along with organizational tenure, were among the only factors typically associated with burnout.

For the remaining research domains, only a handful of controls stood out as frequently associated with the variable of interest. Personality, for example, was infrequently associated with many of the demographic variables typically included in empirical investigations using statistical controls, although employees' education was associated in over half of the reported effect sizes. Factors such as perceived organizational support, justice, commitment, and positive affect were each frequently associated

[5]We make this observation with the caveat that some of these results are based on relatively small sample sizes.

with LMX, but these factors were rarely included as statistical controls. Finally, for justice and affect, only a small number of commonly used statistical controls showed associations. For workplace justice, agreeableness, positive affect, income-related controls, and job satisfaction demonstrated significant relationships in more than half of the reported effect sizes, and for affect, only income-related factors and organizational commitment stood out as commonly associated factors.

Why Are Controls Included

Table 3 includes results pertaining to the justifications used for including control variables. As seen in this table, there are subtle distinctions across the focal domains including whether or not existing research offers any type of justification for the inclusion of controls. Whereas turnover researchers offer a justification in nearly 80% of studies, only 60% of studies investigating burnout include a justification. Moreover, results summarized in Table 3 indicate that established domains (i.e., performance, OCBs, turnover, job satisfaction, commitment) offer more justifications than relatively newer domains (i.e., burnout, LMX, justice, affect).

Other distinctions are seen within the justifications themselves. For example, LMX, commitment, and affect research each relies more heavily on anticipated relationships than on previously found relationships than other research domains. Burnout researchers, in contrast, describe anticipated relationships as a justification for including controls in only 10% of studies. Instead, burnout researchers, as well as performance and personality research, focus more heavily on previously found relationships as a justification for their inclusion or exclusion. Results point to less variability across other categories including incremental, theoretical, analytic, and process justifications. Notably, fewer than 10% of all studies using a control variable offer a theoretical justification. An examination of these theoretical justifications revealed few consistencies, but human capital and relational demography theories were either referenced explicitly or used implicitly as an underlying explanatory mechanism in nearly two dozen studies.

In addition to an overall lack of theoretical justification, fewer than 5% of studies describe any type of process for deciding to include or exclude control variables. A closer examination of these 103 justifications revealed the following combinations: Nearly 31% of articles described a combination of previous use of controls, anticipated relationships, and analysis of their own data; 28% described a two-step justification including previous use of controls in combination with analysis of their own data; nearly 19% combined previously found relationships with an analysis of their own data; and roughly 8% combined an anticipated relationship rationale

TABLE 3
Types of Control Variable Justifications Offered Across Popular OB/HRM and Applied Psychology Domains

Research domain	Justification	Citation	Previous	Anticipated	Found	Incremental	Eliminate	Theoretical	Analysis	Process	Multiple
Performance	76%	42%	6%	24%	31%	6%	17%	3%	11%	2%	17%
OCBs	75%	45%	8%	25%	22%	8%	18%	6%	12%	2%	18%
Turnover	79%	39%	11%	32%	24%	6%	18%	7%	12%	5%	21%
Job satisfaction	75%	40%	9%	22%	29%	4%	21%	3%	13%	3%	21%
Organizational commitment	71%	34%	9%	31%	18%	3%	15%	2%	13%	4%	15%
Burnout	60%	36%	1%	10%	31%	4%	20%	1%	13%	-	13%
Personality	75%	45%	1%	21%	30%	8%	17%	3%	10%	3%	11%
LMX	65%	46%	4%	36%	13%	3%	19%	2%	10%	4%	17%
Justice	63%	40%	10%	25%	22%	2%	9%	2%	8%	2%	13%
Affect	63%	36%	1%	34%	19%	6%	16%	5%	7%	2%	15%
Overall	72%	41%	7%	26%	25%	5%	17%	4%	11%	3%	17%

Note. The numbers in this table are not mutually exclusive. Some studies used the same justification for multiple control variables (within a research domain and/or across domains). The total % within each row does not add up to 100% because some studies used multiple justifications that were not mutually exclusive (with the exception of anticipated and found relationships, which were forced into a dichotomy for 99% of studies). Justification = the % of studies offering at least some kind of justification for the inclusion/exclusion of a control variable; Citation = the % of studies offering at least one citation in their justification of a control variable; Previous = the % of studies referencing previous research using that variable as a control; Anticipated = the % of studies justifying the inclusion/exclusion of a control by describing an anticipated relationship between the control variable and a focal domain; Found = the % of studies citing previously found relationships between a control variable and a focal domain; Incremental = the % of studies employing a control variable for the purpose of incremental and/or discriminant validity; Eliminate = the % of studies mentioning the desire to eliminate alternative explanations; Theoretical = the % of studies offering a justification that attempts to answer the *how* and the *why* control variables relate to a focal domain (see Bacharach, 1989 and Sutton & Staw, 1995); Analysis = the % of studies that analyzed their own study data to help determine control variable inclusion/exclusion; Process = the % of studies describing (at a minimum) a two-step process for deciding control variable inclusion/exclusion; Multiple = the % of studies using two or more justifications for a control.

with analysis of their own data. We found other combinations when examining the more general use of multiple justifications without the explicit description of a process. For example, roughly 25% of studies using a twofold justification did so because of previously found relationships in combination with a desire to eliminate alternative explanations. Another 21% justified controls with a combination of anticipated relationships and a desire to eliminate alternative explanations, and still another 10% described previously used controls in combination with a desire to eliminate alternative explanations.

We report an additional examination of control variable justifications in Table 4, which includes results pertaining to justifications for specific controls for each research domain. This breakdown reveals some important distinctions from the generalized findings found in Table 3. Specifically, researchers including positive and negative affect in the study of job satisfaction justify their inclusion over 90% of the time. Organizational commitment researchers using industry and work experience as well as personality researchers using race and work experience as controls also justify their inclusion in over 90% of studies. Such findings are encouraging, but not all controls described in Table 4 include such justifications. For instance, LMX research justifies managers' age as a control in fewer than 20% of studies. Other controls such as age in the study of burnout, education, and managers' gender in the study of LMX, and workload in the study of affect are also infrequently justified, with each offering a justification in fewer than half of all instances.

Two other notable distinctions between the specific results summarized in Table 4 and the more generalized results found in Table 3 are the contrast between anticipated relationships and found relationships and the use of theoretical justifications. In relation to anticipated relationships and found relationships, the generalized results found in Table 3 suggest a relative balance between their uses within control variable justifications. This may be the case overall, but within the use of specific controls under each research domain, stark contrasts exist, including those found within the study of organizational commitment for which 80% of studies using work experience as a control describe anticipated relationships whereas no studies describe previously found relationships. In contrast, 65% of job satisfaction studies, including negative affect, reference previously found relationships whereas only 6% reference anticipated relationships explicitly. Moreover, the use of theoretical justifications was seen in only 4% of studies overall, yet a handful of specific controls under several of the focal topics exceeded 10%.

We report results of one final analysis of the justifications given for control variables in Table 5, which breaks down justifications by type of control. Results reported in this table indicate specific controls such as

TABLE 4

Control Variable Justification Breakdown by Popular OB/HRM and Applied Psychology Domain and Most Frequent Controls

Research domain	Control variable	Justification	Citation	Previous	Anticipated	Found	Incremental	Eliminate	Theoretical	Analysis	Process	Multiple
Performance	Gender	71%	46%	6%	22%	31%	1%	15%	1%	11%	2%	13%
	Age	67%	39%	7%	21%	29%	1%	17%	1%	12%	2%	18%
	Organizational tenure	82%	43%	10%	23%	30%	2%	15%	1%	14%	1%	15%
	Organization/group size	73%	44%	6%	30%	30%	3%	6%	3%	13%	3%	16%
	Education	74%	42%	5%	18%	29%	0%	16%	0%	16%	0%	11%
	Race	78%	56%	11%	19%	41%	0%	26%	0%	7%	4%	22%
	Job tenure	75%	50%	8%	25%	38%	0%	8%	17%	4%	0%	17%
	Workload/hours worked	78%	26%	4%	35%	26%	4%	17%	4%	9%	4%	17%
	Dyadic tenure	62%	43%	19%	19%	19%	5%	14%	0%	10%	0%	14%
	Group tenure	84%	47%	11%	21%	42%	0%	11%	0%	11%	0%	16%
	Work experience	74%	37%	5%	21%	37%	0%	26%	5%	11%	5%	16%
OCBs	Gender	60%	41%	7%	24%	16%	1%	12%	3%	12%	1%	12%
	Age	63%	46%	9%	24%	19%	2%	13%	2%	11%	2%	15%
	Organizational tenure	80%	47%	10%	22%	29%	2%	18%	2%	16%	2%	18%
	Education	65%	48%	9%	22%	13%	4%	9%	0%	17%	0%	9%
	Organization/group size	78%	44%	6%	39%	22%	0%	6%	6%	17%	0%	6%
	Job tenure	76%	71%	12%	18%	41%	0%	29%	18%	6%	0%	29%
	Race	71%	47%	12%	35%	12%	0%	24%	18%	12%	6%	18%
	Dyadic tenure	71%	36%	0%	43%	14%	0%	7%	0%	14%	0%	7%
	Workload/hours worked	64%	29%	0%	36%	21%	0%	29%	7%	7%	7%	14%
	Work experience	62%	23%	8%	23%	15%	0%	15%	0%	15%	8%	8%
Turnover	Gender	69%	40%	17%	23%	17%	2%	15%	6%	19%	6%	19%
	Age	70%	40%	13%	30%	23%	3%	18%	8%	18%	8%	23%
	Organizational tenure	78%	32%	11%	22%	27%	3%	27%	0%	11%	3%	14%
	Organization/group size	78%	37%	19%	37%	22%	4%	0%	7%	19%	7%	19%
	Race	67%	52%	19%	24%	24%	0%	19%	10%	10%	10%	19%

Continued

TABLE 4 (Continued)

Research domain	Control variable	Justification	Citation	Previous	Anticipated	Found	Incremental	Eliminate	Theoretical	Analysis	Process	Multiple
	Education	85%	50%	15%	40%	15%	5%	10%	10%	20%	10%	25%
	Income-related controls	88%	53%	6%	59%	29%	6%	6%	6%	0%	0%	18%
	Workload/hours worked	69%	31%	8%	8%	46%	8%	15%	0%	8%	0%	15%
	Unemployment-related controls	83%	50%	8%	33%	42%	0%	8%	0%	0%	0%	8%
	Work experience	91%	18%	9%	55%	18%	9%	18%	9%	9%	9%	18%
Job satisfaction	Gender	68%	35%	6%	12%	31%	0%	16%	1%	16%	1%	12%
	Age	66%	38%	9%	20%	27%	0%	16%	2%	11%	2%	11%
	Organizational tenure	78%	36%	8%	22%	25%	0%	28%	0%	14%	3%	19%
	Education	78%	48%	17%	17%	30%	0%	13%	0%	17%	4%	22%
	Race	57%	43%	10%	19%	24%	0%	5%	10%	14%	5%	14%
	Organization/group size	76%	43%	19%	24%	24%	14%	10%	5%	24%	10%	29%
	Negative affect	94%	71%	6%	6%	65%	6%	71%	12%	6%	0%	53%
	Positive affect	93%	79%	7%	29%	43%	0%	71%	7%	0%	0%	50%
	Workload/hours worked	79%	29%	7%	43%	21%	0%	14%	0%	14%	0%	14%
	Income-related controls	79%	43%	7%	29%	36%	7%	7%	0%	14%	0%	21%
Organizational commitment	Gender	62%	38%	8%	25%	15%	2%	13%	2%	15%	2%	15%
	Organizational tenure	81%	41%	14%	35%	22%	5%	19%	0%	19%	5%	27%
	Age	65%	49%	11%	22%	24%	3%	16%	3%	14%	3%	19%
	Education	72%	48%	12%	16%	32%	4%	16%	4%	12%	4%	16%
	Race	65%	35%	5%	40%	5%	5%	5%	0%	15%	5%	10%
	Organization/group size	63%	26%	11%	32%	11%	11%	5%	5%	26%	11%	11%
	Industry[a]	100%	63%	13%	50%	38%	25%	0%	0%	25%	13%	13%
	Workload/hours worked[a]	71%	14%	0%	57%	0%	0%	29%	0%	0%	0%	0%
	Work experience[a]	100%	40%	0%	80%	0%	20%	40%	0%	0%	0%	60%
	Job satisfaction[a]	60%	40%	20%	0%	40%	0%	20%	0%	0%	0%	20%
	Parental status/# of children[a]	80%	60%	20%	40%	20%	0%	20%	0%	0%	0%	20%
Burnout[b]	Gender	50%	30%	0%	10%	20%	0%	10%	0%	15%	0%	0%
	Age	44%	33%	0%	6%	28%	0%	11%	0%	6%	0%	6%
	Negative affect	90%	70%	10%	10%	60%	0%	50%	0%	10%	0%	50%
	Organizational tenure[a]	71%	57%	0%	14%	43%	0%	29%	0%	0%	0%	14%
	Workload/hours worked[a]	71%	29%	0%	0%	43%	29%	43%	14%	14%	0%	29%

Continued

TABLE 4 (Continued)

Research domain	Control variable	Justification	Citation	Previous	Anticipated	Found	Incremental	Eliminate	Theoretical	Analysis	Process	Multiple
Personality[b]	Gender	71%	49%	0%	17%	31%	3%	14%	3%	11%	3%	9%
	Age	79%	50%	0%	13%	42%	4%	17%	0%	8%	4%	4%
	Organizational tenure	77%	38%	0%	31%	23%	8%	8%	0%	8%	0%	0%
	Race	92%	58%	0%	8%	50%	8%	25%	8%	8%	0%	8%
	Education[a]	83%	67%	0%	17%	17%	0%	50%	0%	17%	0%	0%
	Work experience[a]	100%	33%	0%	67%	17%	0%	0%	17%	17%	0%	0%
LMX	Gender	52%	34%	0%	24%	10%	0%	21%	3%	14%	7%	17%
	Age	54%	42%	0%	27%	15%	0%	15%	4%	12%	4%	12%
	Organizational tenure	76%	44%	12%	32%	12%	0%	16%	0%	16%	4%	8%
	Dyadic tenure	56%	44%	6%	44%	0%	0%	11%	0%	0%	0%	0%
	Education	46%	46%	0%	23%	15%	0%	15%	8%	0%	0%	8%
	Organization/group size	75%	42%	0%	33%	17%	8%	0%	0%	25%	0%	8%
	Gender differences[a]	70%	60%	10%	40%	30%	0%	0%	0%	0%	0%	0%
	Age differences[a]	63%	50%	0%	25%	25%	0%	0%	0%	13%	0%	0%
	Manager's gender[a]	38%	25%	0%	38%	0%	0%	13%	0%	0%	0%	13%
	Manager's age[a]	17%	17%	0%	17%	0%	0%	0%	0%	0%	0%	0%
Justice	Gender	56%	46%	5%	13%	31%	0%	3%	0%	10%	2%	7%
	Age	54%	41%	6%	15%	28%	0%	7%	2%	7%	2%	9%
	Organizational tenure	64%	39%	15%	30%	15%	0%	6%	0%	9%	3%	12%
	Education	48%	37%	7%	11%	22%	0%	4%	0%	7%	0%	4%
	Organization/group size	77%	23%	8%	46%	15%	0%	0%	8%	15%	8%	8%
	Job tenure	58%	50%	17%	25%	17%	0%	17%	0%	0%	0%	8%
	Dyadic tenure	70%	60%	10%	20%	30%	0%	0%	0%	10%	0%	0%
	Race	80%	70%	10%	20%	40%	0%	20%	0%	20%	10%	30%
	Industry	60%	30%	0%	10%	30%	10%	10%	0%	0%	0%	0%
	Negative affect[a]	75%	75%	13%	50%	13%	13%	25%	13%	13%	0%	50%

Continued

TABLE 4 (Continued)

Research domain	Control variable	Justification	Citation	Previous	Anticipated	Found	Incremental	Eliminate	Theoretical	Analysis	Process	Multiple
Affect[b]	Employee gender	50%	38%	3%	30%	18%	3%	10%	3%	8%	3%	15%
	Age	50%	31%	3%	31%	14%	3%	11%	0%	11%	3%	17%
	Organizational tenure	47%	29%	0%	29%	12%	0%	0%	0%	6%	0%	0%
	Education	50%	10%	0%	10%	0%	0%	10%	0%	30%	0%	0%
	Job tenure[a]	50%	38%	0%	13%	38%	0%	0%	13%	0%	0%	13%
	Race[a]	67%	57%	0%	29%	29%	0%	14%	0%	14%	14%	29%
	Work experience[a]	67%	50%	0%	50%	0%	0%	17%	17%	17%	0%	17%
	Workload/hours[a]	33%	0%	0%	17%	0%	0%	17%	0%	0%	0%	0%

Note. Unless otherwise noted, all variables refer to employees (e.g., employee gender). The control variables listed under each domain are listed in descending order, starting with most frequently used variable for that domain. Justification = the % of studies offering at least some kind of justification for the inclusion/exclusion of a control variable; Citation = the % of studies offering at least one citation in their justification of a control variable; Previous = the % of studies referencing previous research using that variable as a control; Anticipated = the % of studies justifying the inclusion/exclusion of a control by describing an anticipated relationship between the control variable and focal domain; Found = the % of studies citing previously found relationships between a control variable and a focal domain; Incremental = the % of studies employing a control variable for the purpose of incremental and/or discriminant validity; Eliminate = the % of studies mentioning the desire to eliminate alternative explanations; Theoretical = the % of studies offering a justification that attempts to answer the *how* and the *why* control variables relate to a focal domain (see Bacharach, 1989 and Sutton & Staw, 1995); Analysis = the % of studies that analyzed their own study data to help determine control variable inclusion/exclusion; Process = the % of studies describing (at a minimum) a two-step process for deciding to include/exclude a control variable; Multiple = the % of studies using two or more justifications for a control.

[a]We caution readers against making overly broad generalizations as the % listed in this row is based on fewer than 10 studies.
[b]Inadequate consistency in the controls used within the study of this research domain was found beyond the factors listed in this table. To avoid misrepresentations, we limited the controls listed in this table to only those variables found in five or more studies.

TABLE 5
Control Variable Justification Breakdown by Most Frequent Controls

Control	Justification	Citation	Previous	Anticipated	Found	Incremental	Eliminate	Theoretical	Analysis	Process	Multiple
Gender	63%	41%	6%	20%	24%	1%	13%	2%	13%	2%	12%
Age	63%	41%	7%	21%	25%	1%	14%	2%	11%	3%	14%
Organizational tenure	76%	41%	10%	26%	24%	2%	17%	1%	13%	2%	15%
Education	68%	44%	8%	19%	23%	2%	13%	2%	15%	2%	12%
Organization/group size	73%	38%	9%	32%	23%	5%	4%	4%	16%	5%	14%
Race	70%	50%	9%	25%	25%	1%	17%	6%	12%	6%	18%
Workload/hours	71%	28%	5%	30%	26%	4%	22%	3%	7%	2%	14%
Work experience	70%	31%	5%	35%	21%	2%	17%	5%	8%	4%	17%
Job tenure	68%	53%	9%	20%	33%	0%	22%	10%	5%	0%	18%
Dyadic tenure	66%	46%	9%	33%	13%	1%	11%	0%	7%	0%	5%
Negative affect	92%	66%	7%	25%	42%	8%	52%	8%	7%	0%	45%
Income-related controls	75%	38%	3%	41%	24%	6%	6%	3%	5%	0%	11%
Gender differences	78%	55%	12%	20%	33%	2%	14%	2%	12%	0%	8%
Positive affect	90%	77%	4%	27%	44%	6%	65%	13%	0%	0%	52%
Manager gender	38%	31%	17%	14%	5%	0%	17%	2%	7%	0%	21%

Note. Unless otherwise noted, all variables refer to employees (e.g., employee gender). The numbers in this table are not exclusive. Some studies used the same justification for multiple control variables (across domains). The control variables listed are in descending order starting with most frequently used variable. Justification = the % of studies offering at least some kind of justification for the inclusion/exclusion of a control variable; Citation = the % of studies offering at least one citation in their justification of a control variable; Previous = the % of studies referencing previous research using that variable as a control; Anticipated = the % of studies justifying the inclusion/exclusion of a control by describing an anticipated relationship between the control variable and a focal domain; Found = the % of studies citing previously found relationships between a control variable and a focal domain; Incremental = the % of studies employing a control variable for the purpose of incremental and/or discriminant validity; Eliminate = the % of studies mentioning the desire to eliminate alternative explanations; Theoretical = the % of studies offering a justification that attempts to answer the *how* and the *why* control variables relate to a focal domain (see Bacharach, 1989 and Sutton & Staw, 1995); Analysis = the % of studies that analyzed their own study data to help determine control variable inclusion/exclusion; Process = the % of studies describing (at a minimum) a two-step process for deciding deciding to include/exclude a control variable; Multiple = the % of studies using two or more justifications for a control.

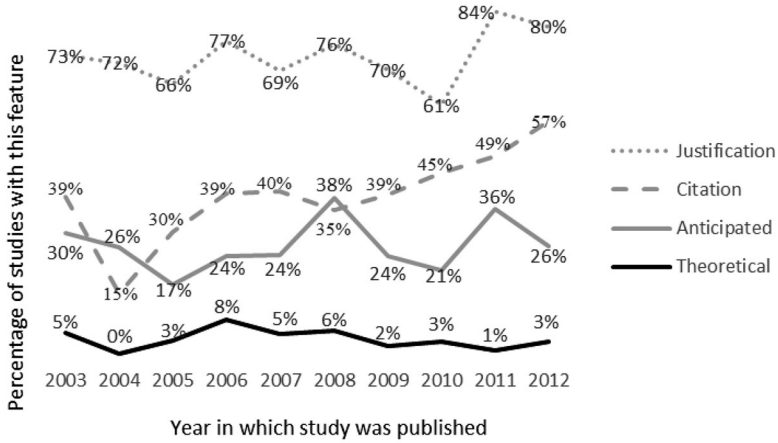

Figure 1: **Control Variable Justifications Over Time.**

Note. Justification = the % of studies offering at least some kind of justification for the inclusion/exclusion of a control variable; Citation = the % of studies offering at least one citation in their justification of a control variable; Previous = the % of studies referencing previous research using that variable as a control; Anticipated = the % of studies justifying the inclusion/exclusion of a control by describing an anticipated relationship between the control variable and a focal domain; Theoretical = the % of studies offering a justification that attempts to answer the *how* and the *why* control variables relate to a focal domain (see Bacharach, 1989, and Sutton & Staw, 1995).

positive and negative affect are explained in 90% or more of all studies. In contrast, fewer than 40% of the studies explain manager's gender, and, despite the near universal inclusion across research domains, only about 60% of studies explain employee gender and age. Other results included in Table 5 indicate a balance between the use of previously found relationships and anticipated relationships across different controls as the basis of inclusion. Furthermore, negative affect is used to eliminate alternative explanations in over 50% of studies, and only one variable, positive affect, is explained in a theoretical manner more than 10% of the time.

Trends Over Time in the What and Why of Controls

In addition to going beyond previously published studies regarding control variables by offering an in-depth examination of which variables were used and why such variables are used in popular OB/HRM and applied psychology research domains, we also investigated the extent to which practices may have evolved over time. As such, we analyzed types of controls and justifications by year. Figure 1 depicts the percentage of studies offering a justification as well as several of the common justifications

seen in the literature. In terms of offering justifications, Figure 1 does not reveal any specific trends, although it is perhaps encouraging to find that 2011 and 2012 saw the greatest percentage of justifications offered. That encouragement is, however, mitigated by the finding that only 3% of studies offered a theoretically based justification in 2012 and only two studies (<1% overall) offered such a justification in 2011. Across the other justifications (note that not all justifications are included in Figure 1), very few trends could be detected across the last decade. In fact, it was quite noticeable that rationales describing anticipated relationships and those describing previously found relationships remained fairly steady over the past decade. Across the generalized topic analyses, the only noticeable trend is a gradual increase in the use of citations in the justifications of controls (from a low of only 15% of studies in 2004 to a high of 57% of studies in 2012). Although not shown in Figure 1, results did not reveal noticeable trends across particular control variables. Specifically, in an examination of the distribution of common controls (e.g., age, gender tenure, education, race) across each of the 10 years included in this review, there were no detectable patterns in either direction (i.e., either increased or decreased use).

Discussion

The use of control variables is an important part of organizational researchers' methodological toolkit due to practical difficulties associated with the implementation of experimental and quasi-experimental designs. Our study builds upon but also extends the accumulated knowledge regarding control variable usage by offering an in-depth review of what variables are controlled for and why such variables are controlled for in the study of some of the most popular research domains in OB/HRM and applied psychology. Given the comprehensiveness and depth of our review, which relied on more than 3,500 control variables used in almost 600 articles published from 2003 to 2012 in *AMJ, ASQ, JAP, JOM,* and *PPsych*, we are able to draw the following general conclusions.

First, in terms of the *what*, results are disappointing to the extent that the overwhelming majority of controls used in some of the most popular OB/HRM and applied psychology domains, which notably span a wide array of diverse theories, converge around the same simple demographic factors. Whereas previously published reviews (Atinc et al., 2012; Carlson & Wu, 2012) also noted a heavy focus on nonperceptual factors, our results document individualized controls rather than a dichotomized summary of perceptual versus nonperceptual controls. Not only does this deeper examination provide more specific information clarifying what is included as statistical controls, but it also allows for a clearer understanding of what is not included as a statistical control. To this point, a lack of

factors such as social desirability is perhaps as troubling as an overindulgence on demographic controls. These findings coupled with the reality that the vast majority of controls rarely relate to focal variables raises legitimate questions about why researchers continue to use such factors despite accumulating evidence against such practices.

Second, our results regarding current practices in justifying control variable inclusion, the *why* of control variables, only reinforces the questions and concerns raised by the convergence of control variables across different domains. As evidenced in Tables 3, 4, and 5, very little effort is made to explain why and how controls relate to focal variables of interest despite relevant and available theoretical options. For example, human capital and relational demography theories appeared explicitly or implicitly in more than two dozen justifications. Human capital theory (Becker, 1964) proposes certain individual characteristics such as tenure, education, and work experience positively affect attitudes (e.g., job satisfaction, commitment) and behaviors (e.g., performance, OCBs, turnover) as accumulated knowledge grants individuals access to better jobs, more lucrative pay, additional resources necessary for successful task performance, and greater incentives to remain once in an organization (Ng & Feldman, 2009; Strober, 1990). Relational demography research, on the other hand, suggests that employees who share similar qualities with other members of the organization enjoy more pleasant interactions, stronger social integration, and enhanced interpersonal attraction, all of which are evident in work-related attitudes and behaviors (Horwitz & Horwitz, 2007; Riordan, 2000; Tsui & O'Reilly, 1989). As these theories explicitly reference many of the common statistical controls found in this review, and frequently explain relationships between popular OB/HRM and applied psychology topics, there is clearly an opportunity to improve current practices in control variable justifications.

Third, instead of offering theoretically based justifications, researchers rely mostly on documenting previous empirical relationships or defaulting to "because they might relate" to the focal variable being investigated. That this finding is a constant across domains and types of controls extends previous reviews that offer summaries of justifications across unspecified domains and controls (e.g., Atinc et al., 2012; Becker, 2005; Carlson & Wu, 2012), and emphasizes the need for better recommendations on how to evaluate potential controls and how to evaluate studies that use statistical controls. That said, we did find differences across established domains and relatively newer domains in terms of offering justifications (i.e., offering a justification, but not the type of justification). As seen in Table 3, established domains such as performance and job satisfaction offered some type of justification in roughly 75% of studies whereas newer domains such as burnout and LMX offered a justification in fewer than

65% of studies. On the surface, this gives the appearance of the maturing of certain research domains over time, and if true, then perhaps many of the concerns raised over control variables in general will eventually work themselves out as research domains evolve. We investigated this possibility with additional analyses of control variable justifications over time and research domain but found no clear directional patterns for either established or newer domains. In other words, specific domains are not offering more justifications or better justifications (i.e., theoretical) as they mature—quelling any thought that things will improve if we just "wait it out." This finding, combined with the more general finding that both the *what* and the *why* remained steady over the last decade, has important implications, which we address next.

One implication (beyond those already described) of our results is that not much progress has been made over the past decade. Perhaps researchers use the same control variables such as gender, age, and tenure across research domains because they are easily accessible in most studies. Perhaps the unique use of control variables in some research domains is due to local norms that have developed within specific literatures. Perhaps practices regarding control variable usage are just another example of particularistic, as opposed to universalistic, scientific principles due to a lack of consensus regarding certain research practices (e.g., Pfeffer, 1993). Or, adopting a more cynical view, and similar to the treatment of outliers (Aguinis, Gottfredson, & Joo, 2013), perhaps the use of control variables is also motivated by whether their inclusion or exclusion favors one's preferred hypothesis.

We believe that it is unlikely that a review similar to ours, but conducted a decade from now, would lead to more encouraging conclusions unless there is a paradigm shift regarding control variable usage. To help advance this change, we offer a series of questions that can be used as a control variable inclusion or exclusion decision-making tree followed by best-practice recommendations for how to report such information. Our recommendations are possible due to the unique features of our review, which built upon but also went beyond previous reviews and are based on one overarching principle: *The choices and procedures regarding the handling of statistical controls should be described in detail, regardless of whether or not the control is ultimately included, to ensure transparency and maximize the likelihood of reproducibility of results in the future*. This is essential to satisfy a skeptical scientific audience that regularly lacks clear understanding as to why a study includes a given control variable or why its absence hinders scientific interpretation and advancement (Aguinis & Vandenberg, 2014). The steps in this process are outlined in Figure 2, and we offer a more detailed description in the paragraphs that follow.

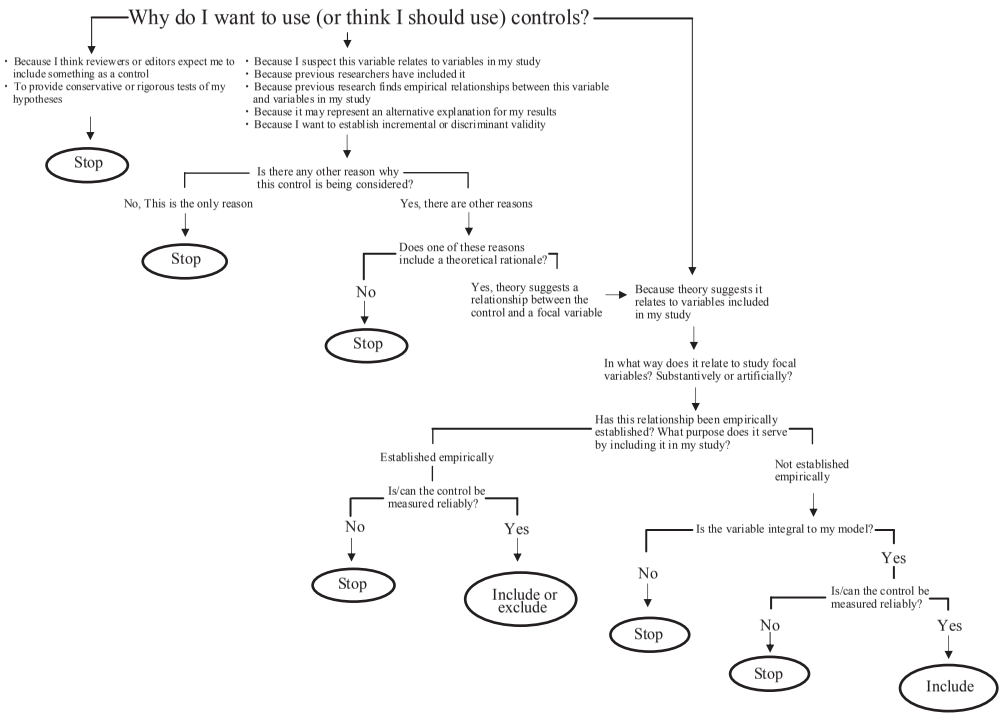

Figure 2: **Decision-Making Tree Summarizing Sequential Steps in the Process of Selecting Control Variables.**

Note. All steps in this process (regardless of ultimate inclusion or exclusion) should be explicitly described in the resulting manuscript.

Best-Practice Recommendations for Control Variable Usage

At the most fundamental level, the process of statistical control should start with one simple question: Why do I want to use statistical controls or think I should use them? The answer to that particular question is not only essential, but it should also be associated with succeeding questions and actions. Our review revealed that the most common response to that question says something to the effect of "Because I suspect this variable relates to variables studied in my research." If this is the answer to the original question, then the follow-up question becomes, is this the only reason why this control is being considered? If the answer to this question is yes, and there is no additional rationale, then there is no justifiable reason to include that particular control in the study. Other answers uncovered in our review include "because previous researchers have included such variables in their study," "because previous research finds empirical relationships between this variable and a variable studied in my research," "because it is significantly correlated with other variables included in my dataset," "because it may represent an alternative explanation for my results," "because it may contaminate my results," or "because I want to establish incremental or discriminant validity." If any of these are the reasons for initial consideration of a control variable, then the researcher is again posed with yet another question: Is this the only reason why the control is being considered? If the answer to this question is yes, then the researcher again does not need to go any further. In isolation, none of these reasons represent sufficient justification for statistical control variable inclusion. Thus, the researcher needs to ask a simple follow-up question: What other reason(s) do I have for wanting to use controls or thinking I should use controls? This process is repeated until the researcher has no other justifications for considering a control. If at no point the researcher is able to point to theory as a possible justification, the process should stop here and no controls should be included in their analysis. That said, this does not mean the researcher should fail to address any variable considered as a potential control in their study; it simply means there is no justifiable reason to include them in their analysis. If, however, the researcher identifies theory at some point during this sequence of questions and answers, the researcher moves on to different follow-up questions as discussed later.

A less common documented response, although we suspect it may be the true genesis for many researchers, is "because I think reviewers or editors expect me to include something as a control." If this is the reason for considering statistical controls, we strongly urge researchers to stop the process. There is sufficient evidence at this point (e.g., Becker, 2005; Breaugh, 2006; 2008; Carlson & Wu, 2012; Meehl, 1971; Spector

& Brannick, 2011, Spector, Zapf, Chen, & Frese, 2000), including this review, to support a decision to not include statistical controls and/or to effectively respond to any reviewer or editor's comments. A second answer that should also stop control consideration surrounds the rationale of "conservative, rigorous, or stringent" tests of study hypotheses. This is a fallacy initially debunked years ago (Meehl, 1971; Spector & Brannick, 2011) with enough accumulated evidence at present to conclude there is nothing conservative or rigorous about including statistical controls (Carlson & Wu, 2012).

As shown in Figure 2, one final response that leads to an alternative sequence of questions is describing a theoretical relationship between a potential control and a focal study variable. Specifically, if a researcher answers "because theory suggests it relates to variables included in my study," then several follow-up questions arise. First, in what way does it relate to study variables: substantively or artificially (i.e., bias)? Although both answers result in a similar follow-up question, the distinction is important and must be reported explicitly in a manuscript. After acknowledging the role theory suggests the control variable plays, three sequential questions follow. Has this relationship been empirically established in existing research (maybe previously answered as described earlier)? What purpose does it serve by including it in their study? Is (can) the variable (be) measured reliably? If the potential control has an empirically established relationship with a study focal variable, then researchers can justifiably argue that inclusion represents an incremental step or an elimination of alternative explanations of study results. To this point, we know science advances incrementally; therefore, it makes sense to "put aside" what we already know and instead focus on previously unexplored relationships. Note, however, it is also possible and justifiable at this point to decide to exclude such variables. If, on the other hand, a researcher has evidence indicating the control represents an artificial relationship (e.g., third-party relationship), then inclusion may justifiably help eliminate contamination (Spector et al., 2000) so long as the variable is measured reliably. Variables considered for inclusion as controls lacking existing established empirical relationships may be either included or excluded depending on how integral they are to a researcher's model and if they can be measured reliably. Integral variables should be included as either additional focal variables or as exploratory variables. Nonintegral variables and those not measured reliably should be excluded.

It is at this point, when each of the aforementioned questions has been asked and answered, that we argue that the control variable paradigm needs to take another step forward. In particular, the sequence of questions and answers that the researcher addressed (implicitly or explicitly) to get to this point needs to be clearly and unequivocally acknowledged in every

manuscript. Describing a process for inclusion or exclusion, featuring a theoretical justification that addresses the *what*, the *how*, and the *why* between controls and focal variables (see Bacharach, 1989; Sutton & Staw, 1995), is a necessary step. Given that our review uncovered that fewer than 5% of researchers currently engage in such practices (see Table 3), we recommend that journal policies adopt an acknowledgment statement in the required submission checklist that says something analogous to "all statistical controls considered for inclusion have been described in this manuscript, regardless of ultimate inclusion or exclusion." Similarly, beyond the necessity of reporting and acknowledging the control variable inclusion or exclusion process, researchers also need to heed already offered advice and be more diligent in reporting standard descriptive statistics for all controls, including reporting correlations and significance levels (Atinc et al., 2012; Becker, 2005; Carlson & Wu, 2012), as well as evaluate and describe results with and without controls (Aguinis & Vandenberg, 2014). This information, including the reliability of controls, takes on greater importance given the variables and justifications currently offered in existing research. That is, if controls (e.g., positive affect, see Table 5) are used to rule out alternative explanations, then their measurement needs to be reliable for researchers, reviewers, editors, and a healthily skeptical scientific readership to feel confident about parsed-out variance and the stability of regression weights. Thus, we believe these are practically feasible changes in policy that will help ensure this paradigm shift not only begins but is also eventually ingrained in our research practices.

Illustrations of Best-Practice Recommendation Implementation

Having described a series of questions and answers that represent current best practices, we now turn to published illustrations across different studies to demonstrate how our recommendations might feasibly and practically take shape. As the overarching recommendation detailed in the preceding passage suggests, it is important to discuss the control variable inclusion or exclusion process openly and transparently. So, control variables might be introduced with a simple statement such as, "We identified several potentially relevant control variables" (Bauer, Erdogan, Liden, & Wayne, 2006, p. 302). Such a statement acknowledges controls were considered but does not bind the authors to including such variables in their analysis. With such an introduction included, researchers may then describe specific reasons for these possible controls (i.e., answer the question that begins the control variable inclusion/exclusion decision tree shown in Figure 2; Why do I want to use, or think I should use, controls).

One type of rationale refers to a potential relationship between the control and a focal variable. In an example of how this might be phrased, Tangirala and Ramanujam (2008, p. 1194) justified including several demographic controls by stating that "it was possible that nurses who worked full-time, had enhanced job responsibilities, and were more experienced (as reflected in their tenure or age) might have greater familiarity with hospital work processes that might enhance their confidence about speaking up at work." Alternatively, in a second example of how this might be phrased, Maltarich, Nyberg, and Reilly (2010, p. 1063) noted that they controlled for employee pay "because pay influences turnover through desirability of movement; if pay is high, alternative employment can be less attractive (Dreher, 1982; Schwab, 1991)."

An alternative (or potential additional rationale) refers to previously found empirical relationships. Examples of such justifications include Kammeyer-Mueller et al. (2012), who controlled for employees' workload in the study of emotional exhaustion (and other variables); Liu et al. (2011), who controlled for job performance and technical levels in the study of turnover; and Tsai, Chen, and Liu (2007), who controlled for job tenure in the study of task performance. What makes these exemplars particularly useful is that, in each case, the authors not only described previously found relationships but also explained why such relationships likely exist. For example, Tsai and colleagues (p. 1575), after describing previously found meta-analytic findings, noted that "This positive correlation may be explained by the fact that employees gain more job-relevant knowledge and skills as a result of longer job tenure, which thus leads to higher task performance." Kammeyer-Mueller et al. (2012, p. 792) continued their justification by explaining that "A heavy workload leads to these negative consequences partially because of the pressure and responsibility attendant on those with such workloads." Finally, as another illustration, Liu et al. (2011, p. 1309) stated that "We controlled for job performance and technical levels, as the turnover literature highlights that competent and experienced employees have more alternative job opportunities and thus are more likely to quit their current jobs."

Other types of rationale that can be used include the desire to eliminate alternative explanations and the desire to establish incremental or discriminant validity. An exemplar of how to describe an incremental/discriminant validity justification is found in Table 1 by Judge, LePine, and Rich (2006), who clearly and thoroughly explained why the Big 5 personality traits should be statistically controlled in examining the relationships between narcissism, task performance, and contextual performance. Moreover, an exemplar of how to explain the elimination of alternative explanations was offered by Côté and Miners (2006), who explained why LMX should

be controlled for in the study of intelligence and job performance. Specifically, they wrote:

> We controlled for leader-member exchange to rule out an alternative explanation of any results. Leader-member exchange denotes the quality of the relationship between an employee and the employee's supervisor (Graen and Uhl-Bien, 1995). Evidence linking emotional intelligence to the quality of social relationships (Lopes et al., 2004) suggests that emotional intelligence may be related to leader-member exchange. Moreover, leader-member exchange is related to job performance (Gerstner and Day, 1997), and supervisors may provide lenient ratings to subordinates with whom they have good relationships. Thus, individuals with high emotional intelligence and low cognitive intelligence could have received high ratings because they developed good relationships with their supervisors. (pp. 11–12)

After offering some combination of the answers in the preceding paragraphs, researchers must answer the question: *Do these reasons include a theoretical rationale?* If the answer describes the *what*, the *how*, and the *why* (in a manner similar to the examples listed earlier), the next step in a sound control variable explanation is examining and describing the relationship between potential controls and focal variables (Becker, 2005). This step does not need to be overly complex, but it does need to be included regardless of a researcher's ultimate decision. For example, a simple statement such as "In general, these variables were not significantly correlated with our dependent variables. As there was neither strong theory nor previous empirical research suggesting their inclusion, we excluded them from the analyses reported here. However, the same pattern of results is found if these variables are included" (Ambrose & Cropanzano, 2003, p. 271) is appropriate (see Becker, 2005; Breaugh, 2006). As an additional illustration, authors might state "However, because tenure in either form was not correlated with withdrawal behaviors, and because the addition of tenure did not change the significance level of any of the results, we report the results without controlling for tenure" (Erdogan & Bauer, 2010, p. 1109).

In summary, combining the aforementioned illustrations into a single statement leads to the following template that can be used in future research:

> We considered several potentially relevant control variables including A, B, and C. Previous empirical research, including a recent meta-analysis by . . . , suggests a relationship between A and X and between B and X. As theory explains, the relationship between A and X exists as a result of . . . Moreover, B impacts X to the extent that . . . Finally, researchers also suggest a relationship between C and X as . . . Given these relationships, it is possible X relates to Y not because . . . , as our theorizing suggests,

> but rather because . . . Thus, to eliminate alternative explanations and to demonstrate the unique relationship between X and Y, it is important to parse out the variance between these controls and our predictor variable. That said, examination of the bivariate correlations found in Table XX indicates A and B are not significantly correlated with X. C is not only significantly related to X, but it relates in a manner consistent with our theory-based expectation that . . . Comparison between our hypotheses tests with and without A and B yielded identical results. Thus, to maximize statistical power and offer the most interpretable results, we report the results without controlling for A and B. We do, however, control for C given the correlations found in Table XX and the theory presented in our research.

Limitations and Future Research

Although our review was more comprehensive and subsequently allowed for more precise recommendations than previous efforts, we are nevertheless mindful of certain limitations. For example, some studies justified multiple control variables and/or using control variables for multiple focal variables with the same justification. As a result, these controls and justifications were weighted more heavily than other studies including unique justifications and/or singular controls when calculating some of the percentages reported in our review. It is also important to note that the 10 research domains included in our review may not represent the broader field of management. Because of this, it is possible that including different research domains, other journals, or a different search process may yield additional recommendations. On a related note, most of the variables studied across the 10 research domains frequently take on unique roles (i.e., predictor, criterion, moderator, or mediator). We attempted to investigate the impact of such differences on results described in Tables 2–5, but very few of the combinations (e.g., LMX $\times$ employee gender $\times$ predictor) resulted in enough cells for any type of meaningful comparison. Thus, we are unable to parse our recommendations based on the role a control variable plays in a primary study. We should similarly address the implications of including or excluding particular controls. That is, we did not examine changes in study results and/or study conclusions based on specific control variables. In part, this was a result of the focus of our manuscript (i.e., investigating the *what* and the *why*), but it also had to do with practices in current studies in which many researchers fail to report enough data to accomplish such a task (Atinc et al., 2012). Future research that employs simulation methodologies, perhaps manipulating the role of the focal variable, could help empirically demonstrate the harmful effects of including or excluding specific controls.

One final issue, which is not a limitation per se but rather an important point of clarification, surrounds the best-practice recommendation

that control variables be explained in a theoretically relevant manner. Specifically, using such a suggestion as the foundation of the decision tree found in Figure 2 opens up our recommendations to criticism that not everything needs to be theory driven (cf. Hambrick, 2007). We agree that not every decision needs to be driven by or contribute to an explicit theory (e.g., social exchange theory). However, such decisions about control variables need to rely on a clear and explicit rationale for the expectation that control variables relate to focal variables in some way. Without having at least some general understanding and expectation of how and why variables relate, it is difficult for researchers to determine what variables to include in a study, how to measure such variables, or how such variables should be treated in analysis (Breaugh, 2006). To this point, we refer the reader to the theoretical justifications included in Table 1. The first example is rather lengthy, referencing a specific theory, yet the other two examples do not refer to an explicit theory and are less than three sentences long. Thus, researchers do not have to explicitly reference a specific theory or describe how the control alters existing theory to follow best-practice recommendations but rather simply explain how and why control variables fit within their overall model.

Conclusion

At first glance, our review is discouraging as it uncovered an insufficient lack of progress in terms of control variable usage in OB/HRM and applied psychology over the past decade. Moreover, results indicate that many researchers treat statistical controls as an afterthought rather than as an integral part of research design and analysis. On a more positive note, however, the in-depth nature of our review allowed us to distill best-practice recommendations that we hope will serve as a useful tool and guideline for authors as well as journal editors, reviewers, and readers. Given recent challenges to the credibility of research results in OB/HRM, applied psychology, and related fields (e.g., Bedeian, Taylor, & Miller, 2010; Kepes & McDaniel, 2013; O'Boyle, Banks, & Gonzalez-Mule, 2014), there is an urgency to implement research practices that abide by fundamental scientific principles such as replicability and professional standards. Because the inclusion or exclusion of control variables, as well as the process implemented to make those decisions, have important consequences for substantive research conclusions, we hope our recommendations will help systematize and increase the transparency as well as theoretical bases and rationale for control variable usage in the future.

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