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COMMENTARY

The baby and the bathwater: On the need for substantive–methodological synergy in organizational research

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Murphy (2021) argues that the field of industrial-organizational (I-O) psychology needs to pay more attention to descriptive statistics ("Table 1"; e.g., *M*, *SD*, reliability, correlations) when reporting and interpreting results. We agree that authors need to present a clear and transparent description of their data and that descriptive statistics and plots can be helpful in making sense of one's data and analyses (Tay et al., 2016). Many journals already require this. Although this information can be presented in the manuscript, more details can be placed in online supplements where there are fewer space limitations (e.g., detailed presentation and discussion of descriptive statistics, missing data and outliers, plots and diagrams, conceptual issues, and computer syntax). However, we strongly disagree with Murphy's claim that "*increasing complexity and diversity of data-analytic methods in organizational research has created several problems in our field*" (p. X). This claim suffers from two important oversights: (a) It neglects the crucial role of methodological

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fit, or the notion that theory, methods, and analyses need to be aligned, and (b) it neglects the fact that in I-O research, most constructs are not directly observable but need to be inferred indirectly though latent variable models. We expand on both issues, using examples to illustrate that the complexity and diversity of data-analytic methods are not a threat but a blessing for I-O research (and beyond). Finally, we conclude by highlighting the need for substantive–methodological synergies to solve some of the issues raised by Murphy.

The importance of methodological fit

Methodological fit refers to the "*internal consistency among elements of a research project*" (Edmondson & McManus, 2007, p. 1155). It concerns the alignment among research questions, prior work on the topic, research design, analyses, and contribution (Hamaker et al., 2020). Methodological fit implies that data-analytic methods need to be attuned to theoretical questions, an idea that is reflected in the statement "*extraordinary claims require extraordinary evidence.*" Human behavior is dynamic, multifaceted, and complex, and it occurs in interaction with equally complex social systems. We thus need sophisticated designs and methods to capture this complexity if we want to understand human behavior. In I-O research, this complexity takes several forms (discussed below), thus placing requirements of our methods, all of which go beyond the consideration of descriptive statistics.

Many phenomena in I-O psychology are multidetermined

Because many of the phenomena in which I-O psychologists are interested are multidetermined (involving dispositional, situational, organizational, and societal sources of influences) and involved in complex causal chains (including mediation and moderation), the idea of methodological fit implies that to address these complex issues, multivariate data-analytic methods are required. Although several examples can be given, one that recently gained attention is balanced need satisfaction. More precisely, individuals with balanced satisfaction in the needs for autonomy, competence, and relatedness should experience higher levels of well-being than people with the same aggregate level of, yet less balanced, need satisfaction (Sheldon & Niemiec, 2006). Importantly, the role of need (im)balance cannot be tested using descriptive statistics because it necessitates an inherently multivariate approach (Gillet et al., 2020).

Much of our data have a nested data structure

Because people typically work in teams, and teams in organizations, I-O data often have a nested data structure. The same is true when repeated measurements are nested within individuals. Such data structures create dependencies in the data (e.g., the commitment of employees working within the same group is likely to be more similar than that of employees from different groups; Schreurs et al., 2021). These dependencies need to be considered to properly analyze such data, necessitating multilevel methods (Morin et al., 2021). Two examples show how crucial methodological fit is for multilevel data. In educational psychology, the big-fish-little-pond effect (Marsh et al., 2014) shows that the effect of classroom levels of achievement on the academic self-concept (negative) differs from that of individual levels of achievement (positive) due to social comparison processes. Likewise, McCormick et al.'s (2020) meta-analysis shows that, when comparing between-person and within-person associations (repeated measurements), associations are different across levels of analysis 24.1% of the time. Thus, when dealing with nested data, one needs to take these dependencies into account, which necessitates multilevel or time-structured models. This means that raw scores and descriptive statistics alone might not be sufficiently informative.

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Psychological phenomena are usually dynamic

I-O research is often interested in phenomena that develop, evolve, and change over time. These phenomena can have a beginning, a development, an evolution, and a completion, and many of them (e.g., self-esteem) are known to present trait and state components (Perinelli & Alessandri, 2020). Job attitudes change over time, performance is dynamic, and affect at work is incredibly fluctuating, just to mention a few examples. Expecting these changes and fluctuations to be accurately represented by simple descriptive statistics is, at best, unrealistic and becomes impossible when facing nonlinearity and interindividual variation in shape (e.g., Navarro et al., 2020). Even when considering the relatively simple case of mediation, Murphy (2021) implicitly assumes that we can test mediation from a static perspective, which ignores the fact that most of our theories assume the presence of dynamic psychological processes that unfold over time. For this reason, accurate tests of mediation require longitudinal designs (Cole & Maxwell, 2003) and the ability to disaggregate sources of within-person versus between-person variation.[1]

The questionable assumption of population homogeneity

Most I-O studies implicitly assume that a single set of "averaged" parameters can be used to describe the population. Yet, awareness is growing that this assumption is often too simplistic (Meyer & Morin, 2016). Hofmans et al. (2020) argue that several of our theories imply population heterogeneity rather than homogeneity: People can hold distinct configurations on a series of indicators reflecting their career orientation (McLarnon et al., 2015), their motivation (Tóth-Király et al., 2021), or their commitment (Meyer & Morin, 2016), and these can follow distinct longitudinal trajectories (Fernet et al., 2020). To detect heterogeneity, person-centered analyses are needed (Meyer & Morin, 2016). For instance, Solinger et al. (2013) revealed that the bond between newcomers and their organizations could develop in different ways, whereas Morin et al. (2013) demonstrated the indissociable nature of self-concept levels and stability. Identifying profiles of employees is also more naturally aligned with managers' tendencies to think in terms of categories (Mäkikangas & Kinnunen 2016). The person-centered approach is thus particularly helpful for guiding intervention strategies that are tailored to the needs of distinct types of employees, an approach that has yielded benefits for burnout intervention (Hätinen et al., 2009). If we want to relax the often-unrealistic assumption of population homogeneity, we need to embrace complex data analyses. Moreover, heterogeneity cannot be inferred from the inspection of descriptive statistics and correlations, which suggests that the interpretation of such sample-level statistics can be misleading.

Many theories, even simple in appearance, cannot be empirically tested without complex data analyses

Many good theoretical models seek to capture the complex nature of human reality,[2] which requires complex data analyses. For instance, Lawler's (1992) theory of empowerment—highlighting the role of complementariness and coherence in leaders' empowerment practices—has long been used in textbooks and as a guide for intervention. However, a proper test of this theory has been lacking until Chénard-Poirier et al. (2017) found partial support for its propositions using a hybrid mixture regression approach. Similarly, to test the dynamic model of the psychological contract properly, dual regime models are required. Indeed, dual regime models "mimic the theoretical processes underlying the elicitation of violation feelings via two model

[1]In addition, contrary to Murphy's (2021) claim, it is not necessary for x and y to be correlated for a partial mediation to exist in the form of x–m–y given that the indirect x–y relationship can have a different sign than the direct x–y relationship and they may cancel each other out (Zhao et al., 2010).

[2]Although some theories themselves might be too complex to be truly useful (Saylors & Trafimow, 2021).

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components: A binary distribution that models whether an event in one's work environment leads to a crossing of the acceptance limits of the psychological contract and a count distribution that models how severe the negative effect of this crossing is" (Hofmans, 2017, p. 8). Last, combining many previous issues (person centered, multilevel, theoretical complexity), O'Neill et al. (2018) identified distinctive patterns of task, process, and relationship conflict located at the team-level that "variable-centered" studies failed to uncover.

As illustrated, merely examining descriptive statistics is not sufficiently informative for many of our research questions, unless we are ready, as a field, to dramatically simplify our theories. In that sense, Murphy (2021) seems to argue in favor of theoretical abstraction and simplicity (assuming a limited set of grand universal laws; Healy, 2017), whereas we believe that there is also value in understanding complexity (Tsoukas, 2017). Life is inherently complex—it is interconnected, multifaceted, paradoxical, ever-changing—and advanced statistics help us come to grips with it.

The need for latent variable models

In I-O psychology, many constructs are not directly observable. We rely on questionnaire data, where responses to multiple items are assumed to reflect an underlying psychological construct. These unobservable constructs do not possess readily established measurement units (like sex or tenure) but units that emerge from our data analytic models. These units can be a function of the response scale or the distribution of scores obtained in the sample (standardization) or population (norms; Meyer & Morin, 2016). Our measures are thus, by definition, imperfect, which makes descriptive statistics equally imperfect. Indirect measurement poses several challenges, which can be resolved using latent variable models. In what follows, we list some of those challenges that illustrate why latent variable models are critical for advancing our understanding of I-O phenomena.

As a starting point, studies that use multiple indicators to measure any construct should routinely test the measurement model relating these indicators to the latent factors. Without support for the measurement of the constructs, subsequent analyses are dubious. The full measurement model should be presented in sufficient detail to be evaluated, perhaps in online supplements. The latent correlation matrix among constructs based on this measurement model is more useful and accurate than the manifest correlation matrix suggested by Murphy (2021). Thus, the measurement model is central for both Murphy's descriptive goals and as a bridge to more complex models.

Random measurement error

Due to the imperfect nature of our measures, manifest scores contain random measurement error, which attenuates our estimates of associations between variables. In most research settings, reliable measurement (i.e., true score variance: the total variance minus the variance due to random measurement error) is reflected in the covariance among ratings that is obtained across various indicators of the same construct, whereas the unique part of each indicator incorporates random measurement error. However, in nonlatent analytic models, these two sources of variance are conflated. Whereas latent variable models naturally separate them, allowing for tests of associations corrected for random measurement error, properly accounting for measurement error is far more complex than simply relying on latent variable models. For example, Marsh and Hau (1996) demonstrated that test–retest correlations based on manifest variables tend to be upwardly biased by the failure to account for longitudinal correlated uniquenesses among the matching indicators used repeatedly over time. Marsh et al. (2010a) similarly demonstrated the need to account for wording effects (e.g., negative wording, parallel wording) to achieve an accurate representation of the structure of our constructs. With multilevel data, measurement error due to "interitem agreement" occurs separately across levels of analysis, and "interrater agreement" between members of

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the higher level reality (e.g., a workgroup) are also likely to bias measurement (Morin et al., in press). To make matters worse, Marsh et al. (2010b) demonstrated that rather than attenuating associations, multilevel sources of measurement error, in combination, could create artificial associations between constructs (referred to as phantom effects). Finally, despite their well-controlled nature, laboratory experiments are subject to the same challenges, including biased estimates of intervention effects (Breitsohl, 2019). These examples all demonstrate that descriptive results based on manifest variables can be misleading when working with unobservable constructs.

Disentangling distinct sources of variance

Recent developments have shown that measurement issues tend to be a lot more complex than previously believed (Morin et al., 2020). For example, statistical research has highlighted the need to account for distinct forms of true score variance in conceptually related and hierarchically ordered constructs (Morin et al., 2017). Exploratory structural equation modeling has been recommended as a way to account for the presence of conceptually related constructs by incorporating cross-loadings (Asparouhov et al., 2015), whereas bifactor modeling has been recommended for hierarchically ordered constructs (Morin et al., 2017). In research involving ratings from different sources (e.g., teams, supervisor, assessment centers), more complex latent variable models and mixed effects models for cross-classified data are needed to isolate the multiple sources of variability that are present in these ratings (O'Neill et al., 2015). Such latent variable techniques have advanced our knowledge of measurement in a way that would have been impossible using descriptive statistics, in addition to help model the complexity of real-world phenomena.

Improved techniques for testing moderation

Moderator effects are central to many models and theories. Murphy (2021) rightfully argues that tests of moderation suffer from several issues, including low reliability (and associated low power) of the interaction term. However, rather than taking a step back and reverting to descriptive statistics, it is equally valuable to take a step forward and work with latent variable models, which make it possible to tackle moderation in a way that accounts for unreliability (Marsh et al., 2013). Once again, why not use the strengths of our complex data-analytic methods, which offer clear solutions to many of the issues that we face in our field.

The baby and the bathwater: The need for substantive–methodological synergy

Having argued that complex data-analytic models are critical to addressing the complex questions that we ask in I-O research, we share Murphy's (2021) concern about the incorrect application and interpretation of those methods and the growing science–practice gap. This phenomenon has been known for decades (see Borsboom, 2006; Marsh & Hau, 2007) and can be tied to multiple issues, including (a) the lack of proper statistical training in graduate school, (b) the fact that applied researchers often struggle to keep pace with the fast pace of methodological innovations and the equally fast-paced evolution of their theoretical fields after graduate school, (c) the fact that some methodological experts sometimes lose sight of the true needs of applied researchers, and (d) that present statistical innovations in a formal (equation-based) manner that falls beyond the understanding of applied researchers. However, Murphy seems to fail to recognize that "simple" techniques are only seemingly simpler because they make more simplifying assumptions, many of which may be false (oversimplification). In other words, the "burden of assumptions" may be heavier with simple techniques. Moreover, when pushed to the extreme, resorting to descriptive statistics to capture reality may come to imply that inferential statistics and modeling should be replaced by storytelling. Despite our sympathy with Murphy's claim that more attention should be afforded to descriptive statistics, we thus believe in an alternative and more creative route: substantive–methodological synergies.

The term substantive–methodological synergy has been proposed by Marsh and Hau (2007) to describe joint ventures in which new methods provide novel insights into important substantive issues. Such joint ventures involve collaboration between substantive and methodological experts to ensure that (a) the methods are applied correctly to match the needs of the research area and that the findings are translated in a meaningful way to applied researchers and practitioners and (b) new methodological developments are connected to the needs of applied researchers and translated in a way that makes sense to them. For example, the growing field of big data and data science in I-O psychology requires both theoretical and methodological sophistication (Woo et al., 2020). Thus, rather than reverting to the simplest tools, I-O scholars need to acknowledge that human behavior is complex and that advanced methods are needed to capture that complexity. Unfortunately, true substantive–methodological synergies (i.e., articles where theory and methods are positioned as dual objectives) remain unwelcome in many I-O journals, due to the false idea that articles should tackle one main objective and that methodologically oriented articles should be sent to methodological journals. Moreover, providing complete and accurate coverage and interpretation of both theoretical and methodological components typically requires more space than is often available in I-O journals.

We hope that this article might reduce these obstacles and pave the way for substantive–methodological synergies in I-O research. Rather than throwing the baby (i.e., proper statistical modeling) out with the soiled bathwater (the challenges posed by the correct application and interpretation of these methods), substantive–methodological synergies make it possible for I-O psychologists to solve the true problems raised by Murphy (2021), without sacrificing the theoretical richness of our field. Researchers should not shy away from complex methods, which have been born out of a genuine need to model human complexity. We do not see these synergies as the only way forward but as one out of many (e.g., including better statistical training) that may help to reduce the ever increasing gap between statistical developments and applied research. We are also not claiming that "simple" research has no value or that fundamental statistical developments should stop. Rather, we are simply claiming that more work is needed to bridge those two.

Finally, sharing Murphy's (2021) concern about the science–practice gap, we agree that we need to educate ourselves and our readers more properly regarding the functionality and interpretability of our models and make a concerted effort to explain how our findings can inform practice. If anything, the need for clarity increases as questions and analyses become more complex. However, clarity is not synonymous with simplicity and, although we agree that "Table 1" is important, we have provided several examples that "simple" statistics can be misleading and/or inappropriate for the research question at hand. It is thus incumbent on researchers who are seeking to achieve substantive–methodological synergy to keep in mind the need to communicate their findings clearly to achieve that synergy.

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