

Methods of Mindfulness: How Mindfulness is Studied in the Workplace

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Introduction

Interest in mindfulness in the workplace has been on the rise. A recent surge of research has built a compelling case for mindfulness benefits and these far-reaching implications continue to attract the interest of organizational scholars. In the past two years alone we have seen research linking mindfulness to work-family balance (Allen and Kiburz , 2012), work engagement (Leroy, Anseel, Dimitrova & Sels, 2013), negotiation outcomes (Reb & Narayanan, 2013), job burnout (Roche & Haar, 2013), resilience to bias (Hafenbrack, Kinias, & Barsade, 2013), working memory (Mrazek et al., 2013) and performance (Dane & Brummel, 2014; Reb, Narayanan & Chaturvedi, 2014). While mindfulness was initially studied as a method of treating ailing clinical populations (Kabat-Zinn, 1990), today its application has expanded to executive boardrooms, elementary school classrooms, professional sports, and military Special Forces. The rapid expansion of mindfulness studies in non-clinical populations, particularly work environments, is exciting for practitioners but also raises a series of methodological concerns for researchers. It is to this end that we focus the contents of this chapter: a review and analysis of how the study of mindfulness has taken place in organizational scholarship. We hope this chapter will offer a roadmap to scholars new to the topic of mindfulness by summarizing prevailing methods and their areas for improvement. We also aim to offer innovative insights for more established researchers by reflecting on directions for further research.

This chapter discusses the study of workplace mindfulness in three sections. First, we review how researchers have studied the various conceptualizations of mindfulness and the major issues concerning the construct of mindfulness altogether.

Clearly operationalizing mindfulness is an important precursor to any other step in the research process for it stands to help define the scope and boundaries of the topic of investigation. In the second section, we review the most commonly used methods in mindfulness research such as experiments, surveys, and mindfulness based interventions. We also discuss several key methodological limitations including self-report measures, and internal and external validity. Understanding the limitations of existing designs may help mindfulness researchers to refine their own research designs and contribute to this growing body of literature.

The final section discusses some exciting avenues for future mindfulness research. These include areas of research that are being pursued by contemporary researchers in mindfulness, but have yet to find their way into published formats. Here we encourage the development of a mindfulness taxonomy that distinguishes between the different types, elements and effects of mindfulness and meditation. Additionally we discuss the promise of multi-level mindfulness research and contextual influences to advance our understanding of workplace mindfulness. Lastly, we urge researchers to expand the breadth of their existing methodologies to incorporate experiential sampling methods, qualitative research and neuroscientific approaches. Building on existing methodologies, integrating new techniques may help paint a more comprehensive picture of mindfulness in the workplace.

The Construct of Mindfulness: Navigating Conceptual Waters

Mindfulness has a wide variety of conceptualizations. While we applaud the diversity of definitions researchers have applied to advance the study of mindfulness, the vast range of mindfulness constructs may hinder rather than help researchers. Workplace

mindfulness has been studied at both the individual and collective level through a number of depictions. In the simplest form, individual mindfulness is anchored by present-moment awareness and by the non-judgmental observation of thought (e.g. Brown & Ryan, 2003; Dane, 2011). Collective mindfulness departs from individual mindfulness by focusing on a group's overall cognitive processes of organizing instead of individual characteristics (Gaertner, 2014). In this chapter, we focus on individual mindfulness; however, for a more extensive review of collective mindfulness research, see Gaertner's chapter in this book.

At the individual level alone, mindfulness has been depicted as: 1) as a state of mind, 2) an enduring dispositional trait, 3) an attitude, 4) a cognitive or affective process, 5) a set of behaviors, 6) a type of meditation, and 7) an intervention program (Vago & Silbersweig, 2012). Not only can it be easy to get lost amongst so many conceptualizations, the wide variability of the term raises several construct validity flags. Construct validity is an estimate of the degree to which a measure consistently assesses the construct it intends to (Jarvis, MacKenzie & Podsakoff, 2003). Below, we visit some of the main concerns related to construct validity from a methods perspective.

Nomological Validity

We, like others before us (Kudesia & Nyima, in press; Grossman and Van Dam, 2011; Lutz et al., 2007), suggest that understanding the traditional context of “mindfulness” may enrich the study of mindfulness in the workplace. Nomological validity describes the relationships between the construct in question and other constructs within the theoretical context (Cronbach & Meehl, 1955). Mindfulness has a profound nomological network and scholars would be remiss to simply pluck one concept from

these ancient eastern traditions, in particular Buddhism, without considering the broader context. When mindfulness is considered within its original context and in relation to other contemplative constructs, it is a means to enlightenment; yet mindfulness in the workplace has primarily been studied as a form of attention (Grossman, 2008). Without accounting for the contemplative context, mindfulness research may be at risk of misconstruing the original meaning of the word. Indeed, several scholars have expressed concern that some mindfulness scales actually assess behavior, which is a departure from the original Buddhist conceptualization where mindfulness is reflected by attentional, cognitive and affective qualities (Mikulas, 2011; Chambers et al., 2009; Rapgay & Bystrisky, 2009).

Construct Validity in Scales

Depending on how one chooses to define mindfulness, careful scale selection may strengthen the construct validity of the measure in several ways. Face validity refers to the extent to which a measure appears capture the construct it purports to assess (Mosier, 1947). If mindfulness is depicted as attention and awareness (e.g. Brown and Ryan, 2003) it may hold low face validity for those that consider mindfulness to include facets such as attitude (e.g. Bishop et al., 2004) or intention (e.g. Shapiro et al., 2004).

Relatedly, content validity refers to the extent to which a measure represents the entire construct (Lawshe, 1975). In this case, some scales may not adequately represent the entire domain of mindfulness, or they may be measuring different aspects of the construct.

We encourage researchers to consider the differences in definitions, contexts, populations, and outcomes when selecting their mindfulness instruments.

In workplace mindfulness research, two scales are often cited: the Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003); and the Five-Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006). Prior research has validated the MAAS with clinical and non-clinical populations (Brown and Ryan, 2003; MacKillop and Anderson, 2007) suggesting it is an appropriate measure for general work populations. Although the MAAS is frequently applied, it has received much criticism (e.g. Grossman, 2008). In Buddhist philosophy where mindfulness represents a pathway to end human suffering, the MAAS has been found to be insufficient for those who consider mindfulness to be more than a one-dimensional construct (Baer et al., 2006; Walach et al., 2007). Such criticism illustrates concerns that the MAAS was developed without any insight from experts in Buddhism or meditation (Chiesa, 2013). Further, the MAAS has been slated for presuming that an individual is self-aware enough to accurately respond (Grossman, 2008; Grossman and Van Dam, 2011; Van Dam, Earleywine & Borders, 2010). In this case subjects without prior mindfulness practice may not have the ability to accurately assess themselves (Grossman, 2008). This may trigger a 'construct representationalism' issue (Van Dam, Earleywine, & Borders, 2010) where the construct validity of mindfulness may be weakened if subjects are not aware of the psychological processes supporting their task response. Further, as an individual's volitional attention improves, the measure may depict them as less mindful as they become acutely aware of their mind wandering (Grossman, 2008; Chiesa, 2013).

Baer and colleagues (2006) created the FFMQ based on five key mindfulness skills: observing, acting with awareness, describing, non-reactivity and non-judgment of inner experience. The FFMQ is conceptually distinct from the MAAS as it includes an

attitudinal aspect in addition to attention and awareness. Although these two scales measure different facets of mindfulness, both purport to measure “mindfulness” without any distinction. When multiple measures of mindfulness are in agreement, these measures are said to possess high convergent validity (Cunningham, Preacher, & Banaji, 2001). Presently there are over ten different scales that assess mindfulness (see Table 1). Of the many mindfulness scales, there is evidence to suggest that these measures exhibit little or even no correlation with each other (Thompson & Waltz, 2007). Baer and colleagues (2006) compared five of these mindfulness scales and examined the correlations of mindfulness with other constructs such as openness to experience, self-compassion, and neuroticism. They found that in most cases, correlations were significant and in predicted directions but that they varied widely. This is hardly surprising given the many conceptualizations of mindfulness.

In sum, mindfulness scales can be distinguished along five dimensions. First, as discussed above, scales differ by the particular facets of mindfulness they seek to measure. Additionally, scales differ by how mindfulness is scored. Some produce multiple scores for the different elements of mindfulness, and others generate a single total uni-dimensional score. For example, the Cognitive and Affective Mindfulness Scale (CAMS: Feldman et al., 2007) assesses several facets of mindfulness but represents them with one total score whereas the Kentucky Inventory of Mindfulness Skills (KIMS: Baer et al., 2004) produces four separate subscale scores for each facet of the construct. A third distinction lies in the state or trait assessment of mindfulness. The MAAS (Brown & Ryan, 2003) and the Toronto Mindfulness Scale (TMS: Lau et al., 2006; Davis, Lau & Cairns, 2009) have both a state and trait version of their scales. Fourth,

some scales were developed under the guidance of experts with long-term mindfulness practices and may thereby reflect a more traditional contemplative conceptualization of mindfulness. For example, the Freiburg Mindfulness Inventory (FMI: Buchheld, Grossman, & Wallach, 2001) was developed with input from Buddhist experts at a Vipassana meditation retreat. A last point of differentiation is the audience the scale is intended for: clinical or non-clinical, and novice or experienced meditators. For example, the FMI (Buchheld, Grossman, & Wallach, 2001) was created specifically for experienced mediators whereas the Southampton Mindfulness Questionnaire (SMQ: Chadwick et al., 2005) and the TMS (Lau et al., 2006) distinguish between novice and experienced meditators. The Cognitive and Affective Mindfulness Scale (CAMS; Feldman, Hayes, Kumar, & Greeson, 2007) was developed for and tested only on clinical populations but other scales (e.g. MAAS) tested on both clinical and non-clinical populations. These and other self-report measures of mindfulness are summarized in Table 1 (see also Baer, 2006; Chiesa, 2013; Sauer et al., 2013; Bergomi, Tschacher & Kupper, 2013b).

TABLE 1. Mindfulness Scales

Scale	Description	Example
Mindful Attention Awareness Scale (MAAS: Brown & Ryan, 2003)	A 15-item trait measure rated on a 6-point Likert-type scale assessing the awareness and attention to internal and external events.	“I do jobs or tasks automatically, without being aware of what I’m doing”; “I find myself preoccupied with the future or the past”
Five-Facet Mindfulness Questionnaire (FFMQ: Baer et al., 2006)	A 39-item trait measure rated on a 5-point Likert-type scale encompassing five facets of mindfulness: 1) observing, 2) describing, 3) acting with awareness, 4) non-judgment of inner experience, and 5) non-reactivity to inner experience.	“I perceive my emotions and feelings without having to react to them”; “I rush through activities without being really attentive to them”
Mindfulness/Mindlessness Scale (MMS: Bodner & Langer, 2001)	A 21-item Western, trait measure rated on a 5-point Likert-type scale assessing four factors (Novelty Seeking, Engagement, Flexibility, and Novelty Producing). One of the original	“ I try to think of new ways of doing things”; “I am rarely aware of changes”; “I make many novel contributions”

measures of mindfulness, this scale examines cognitive flexibility and avoidance of mindless or habitual behavior.

Freiburg Mindfulness Inventory (FMI: Buchheld, Grossman, & Wallach, 2001)	A 30-item trait measure rated on a 4-point Likert scale (the short-form uses 14 items) assesses non-judgmental present moment awareness, openness to (negative) experience, and distinguishes meditator experience.	“When I notice an absence of mind I gently return to the here and now”; “I notice how emotions express themselves through my body”
Kentucky Inventory of Mindfulness Skills (KIMS: Baer et al., 2004)	A 39-item trait measure rated on a 5-point Likert-type scale assessing four aspects of mindfulness (observing, describing, acting with awareness, and accepting without judgment).	“I’m good at finding the words to describe my feelings; “I make judgments about whether my thoughts are good or bad”; “I notice the smells and aromas of things”
Cognitive and Affective Mindfulness Scale (CAMS: Feldman et al., 2007)	A 12-item trait measure rated on a 4-point Likert-type scale that assesses four elements of mindfulness (attention, present-focus, awareness, acceptance/non-judgment) to yield a single total score.	“I am preoccupied with the future”; “I am easily distracted”; “I am able to accept the thoughts and feelings I have”
The Toronto Mindfulness Scale (TMS: Lau et al., 2006)	A 10-item state and trait measure rated on a 5-point Likert-type scale that can distinguish levels of meditation expertise and non-meditators.	“I experience myself as separate from my changing thoughts and feelings”; “I was curious what my mind was up to from moment to moment”
Southampton Mindfulness Questionnaire (SMQ: Chadwick et al., 2005)	A 16-item trait measure on a 7-point Likert-type scale that assesses mindful responses to negative thoughts, and distinguishes meditation experience and psychosis.	Each question starts with: “Usually when I have distressing thoughts and images:” “I am able just to notice them without reacting”; “I am able to accept the experience”
Philadelphia Mindfulness Scale (PMS: Cardaciotto et al., 2008)	A 20-item trait measure on a 5-point Likert-type scale along two sub-scales of mindfulness (acceptance and present moment awareness).	“I try and distract myself when I feel unpleasant emotions”; “I tell myself I shouldn’t feel sad”
Developmental Mindfulness Survey (DMS: Solloway & Fisher, 2007)	A 30-item trait measure rated on a 8-point Likert-type scale assessing one dimension of mindfulness development to capture the additive qualities of a mindfulness practice. Scale development was created through both qualitative (thematic analysis of journal entries) and quantitative approaches.	“I notice more of my body sensations”; “I feel like I’m seeing for the first time”; “Mindfulness makes me feel thankful for things I usually take for granted”
Self-Other Four Immeasurables (SOFI: Kraus & Sears, 2009)	A 16-item trait measure rated on a 5-point Likert-type scale that evaluates 8 thoughts, feelings, and behaviors towards one self and to others (friendly, hateful, angry, joyful, accepting, cruel, compassionate, mean).	“Indicate to what extent you have thought, felt, or acted this way toward yourself and others during the past week: Hateful – toward myself Hateful – toward others”
Comprehensive Inventory of Mindfulness	A 28-item trait measure designed for general populations to assess 4 main factors of mindfulness: 1) present awareness; 2)	“I can accept myself as I am”; “I rush through my activities without paying much attention to them”;

Experiences beta (CHIME-β: Gergomi, Tschacher & Kupper, 2013)	accepting, nonreactive, and insightful orientation; 3) describing of experiences; and 4) open, non-avoidant orientation	“I find it hard to put my thoughts into words” “I tend to suppress unpleasant feelings and thoughts”
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Organizing Multiple Conceptualizations of Mindfulness

What we, in line with others (e.g. Chiesa, 2013), are attempting to convey is that mindfulness is a complex construct lacking scholastic consensus and in need of some organizing framework. One simple suggestion is to re-label the many mindfulness questionnaires to reflect the specific characteristics of interest (Grossman, 2011). On a theoretical level, the various conceptualizations of individual mindfulness can perhaps be better understood through Vago and Silbersweig’s (2012) S-ART framework for understanding the effects of mindfulness training. They suggest that mindfulness is cultivated through 1) self-awareness; 2) self-regulation; and 3) self-transcendence. Respectively, each of these three parts is said to enhance meta-awareness, modulation of behavior, and relationships with oneself so that one can focus on the needs of others. S-ART draws on six further mechanisms through which mindfulness training works: “(1) intention and motivation; (2) attention regulation; (3) emotion regulation; (4) memory extinction and reconsolidation; (5) prosociality; (6) non-attachment and de-centering” (p.15). This framework may provide the scaffolding to integrate the different facets of mindfulness and facilitate a broader understanding of the term. For example, researchers could study the self-awareness aspect of mindfulness through the mechanism of attention regulation with the MAAS (Brown and Ryan, 2003). Alternatively, self-regulation could be studied through memory extinction and reconsolidation drawing on Langer’s (1989) form of mindfulness. Here mindfulness is a cognitive process that interprets phenomenon in new ways from multiple perspectives, without the automaticity of

habitual mental processes that rely on past information (Langer, 1989; Langer & Moldoveanu, 2000; Weick et al., 1999; Weick and Sutcliffe, 2006).

Gaining more clarity around the operationalization of the construct may strengthen methodological design (Chambers et al., 2009) and develop more finely tuned measures (Rapgay & Bystrisky, 2008). This in turn may allow for more precise measurement of the essential active ingredients of mindfulness. The S-ART provides a helpful map for the study of mindfulness, yet, with its wide scope we offer a cautionary note. In studying mindfulness, scholars might take care to avoid the creation of a ten-faceted model of mindfulness that covers so many elements that the construct becomes intertwined with outcomes, mediators, and training processes altogether. A critical first step for scholars is to clearly define mindfulness to establish the boundaries of the populations and relationships under study. Only then, should researchers begin to outline the framework of their methodological design.

In this section we addressed various conceptualizations of individual and collective mindfulness in organizational research and several construct validity issues permeating the study of mindfulness. In doing so, we reviewed existing scales used to assess mindfulness and five ways to categorize them. Further, we suggested that the S-ART might be a helpful framework for researchers to organize and integrate these varying definitions and scales when designing their methodological approaches. In the next section we review the common methodological methods and instruments used in empirical studies of organizational mindfulness: surveys, experiments, and neuroscientific designs. We also discuss the major concerns and areas of improvement for these methods.

Existing Research Methods

Survey Research

Surveys are a widely applied method of studying mindfulness, particularly trait mindfulness. New researchers might ask themselves three general questions to bolster the overall validity of their survey studies. First, what measures are best suited to address the population and context? As discussed in the section above, mindfulness scales assess different conceptualizations of mindfulness thus some measures may fit one's research question better than others. If a researcher does not consider their audience, they may confuse novice meditators struggling with item miscomprehension or offend seasoned meditators that may be skeptical of the recent popular upsurge or 'McDonaldization' of mindfulness. Choosing language that resonates with both novice and advanced meditators may be one way to subdue skepticism related to the introduction of an ancient monastic practice to a corporate environment.

A second consideration is the temporal logistics (i.e. when and how often) around implementing surveys. A common process is to conduct pre and post surveys flanking an intervention, followed by a last survey several months after intervention completion. When to conduct follow-up surveys deserves some reflection as they help shed light on how long effects can be detected, and in what form they manifest. Lastly, both timing and frequency of data collection decisions are of course subject to real world boundaries of access to participants, non-response rates, compliance and attrition.

Surveys often rely on self-report scales that have been developed to measure personality traits and/or emotional and psychological states related to mindfulness. The third survey consideration is to consider how and if multi-source data can be incorporated

to address the limitations of self-reported data. One example of a cross-sectional survey study that incorporated multi-source reporting is Reb, Narayanan, and Ho's (2013) field survey on 231 employees, which examined the relation between mindfulness (awareness and absent-mindedness) and employee performance. Whereas mindfulness was self-rated, the employees' supervisors rated task performance. As hypothesized, awareness was positively related and absent-mindedness negatively related to task performance.

Imagine now if participants had self-rated their own performance measures. Clearly social desirability and objectivity could confound perception. Multi-source data strengthens the overall study design and provides a first line of defense to the criticisms of self-report methods. These three considerations may offer researchers some respite from the limitations restricting survey methods. Such limitations are discussed below.

Limitations of Survey Methods

Self-report. Self-report measures have contributed greatly to furthering mindfulness research. Such psychometric scales are convenient, widely accepted, and empirically supported (Sauer et al., 2013; Baer et al., 2004; Chiesa et al., 2011). Yet, it is widely recognized that there are methodological concerns related with self-report methods (Grossman, 2008; Van Dam, Earleywine, & Borders, 2010; Thompson & Waltz, 2007; Bergomi, Tschacher, & Kupper, 2013a). For instance, mindless behaviors have been associated with a lack of meta-awareness (e.g. Smallwood, McSpadden, & Schooler, 2007) such that individuals unaware of their stream of consciousness may not be able to estimate their mind-wandering patterns (Carriere et al., 2008). This line of thought exposes self-report survey research to greater vulnerability: discrepancies between actual and reported mindfulness; item miscomprehension; biased ratings from variable levels of

respondent experience; scale construction, and inconsistencies from interrelationships among scales meant to distinguish the multiple facets of mindfulness (Grossman, 2008; Baer, 2011).

When relying on self-reported mindfulness, self-enhancement biases should be accounted for. Defensiveness, or a desire to protect one's individual self-concept, may restrict participants from accurately reporting, even unconsciously, behavior they are not proud of or that is socially devalued. In this vein, studies show there is a tendency towards bias in rejecting survey items associated with mindless behavior (Van Dam et al., 2009). One way to mitigate these effects is to recruit a third party to assess the individual when objectivity is a concern (i.e. obtain supervisor assessments in addition to self-report) or use unobtrusive methods like content analysis of digital information (i.e. emails).

Internal Validity. Internal validity refers to the extent to which researchers can be confident that mindfulness is the variable responsible for the measured effects, or in other words, if there might be an alternate rationale that could explain results (Bachrach et al., 2001). Particularly with cross-sectional surveys, the extent to which mindfulness causes the observed effects may be questionable (Chiesa & Malinowski, 2011). In studies comparing meditators to non-meditators, the process of sample selection and demographic considerations may influence results and thus, should be clearly stated (Lykins, Baer, & Gottlob, 2012). For example, if the type of meditation practiced by experienced meditators differs from techniques used by novice meditators, there may be further doubt cast on the reliability of findings (Chiesa & Malinowski, 2011). One well-designed study matched their participants on age and education (Chan and Woollacott, 2007) but not all

studies follow suit (e.g. Valentine & Sweet, 1999; Jha et al., 2010).

Common Method Bias. Common method bias is a further threat to internal validity. It refers to “variance that is attributable to the measurement method rather than to the constructs the measures represent” (Podsakoff et al., 2003, p.879). Surveys, self-report data, and cross-sectional data are susceptible to method effects related to a long list of response biases: halo effects, leniency effects, timing effects etc. (Fiske, 1982). Cross-sectional assessments are at risk of variability that may arise from any ephemeral moodiness of one particularly optimistic or despondent day. Collecting data at multiple points may reduce such variability. A further consideration is that assessments immediately following program completion may exaggerate the acute effects of the intervention itself. Collecting additional post-intervention data after some period of time has passed creates the opportunity for a longitudinal assessment of effects. This is an integral component of mindfulness research given research confirming the compounding nature of positive day-to-day experiences like Fredrickson and colleagues’ (1998) broaden-and-build theory of positive emotions. Mindfulness research should consider accounting for increased daily experiences resulting from a sustained meditation practice (Fredrickson et al., 2008). Researchers might also consider systematically collecting data at similar temporal checkpoints to allow for direct comparisons across studies, and staggering wait-list control groups to allow for more long-term study of effects (de Vibe et al., 2012).

External Validity. In general, survey research has good potential to exhibit strong external validity. For high external validity in mindfulness research in the workplace, choosing scales that are designed for general populations and all meditation levels is

likely most appropriate. For example, the KIMS (Baer et al., 2004) was designed to measure mindfulness based on the dialectical behavior therapy (DBT: Linehan, 1993) definition of mindfulness, but DBT uses shorter exercises in therapeutic contexts that are not necessarily rooted in meditation (Baer et al., 2006). The KIMS, then, may be a good fit for non-meditators in clinical populations. Lastly, selecting scales that are grounded in either information processing theory or contemplative traditions may further strengthen external validity by selecting the commensurate scale to match the context.

Survey Alternatives. The interrelationships of mindfulness and mindlessness are said to operate on subtler, non-conscious levels that may not be easily detected by introspection alone (Levinthal & Rerup, 2006). As such, methods used to measure explicit phenomena may not be appropriate in mindfulness methodology. Implicit measures are advantageous in several contexts: 1) when the construct lies outside of conscious awareness; 2) if evaluations are impacted by social desirability; 3) when there is risk of disengaged participants; and 4) when participants are reluctant to reveal their attitudes (Uhlmann et al., 2012). In situations where evaluation apprehension may occur, implicit or unobtrusive measures are especially appropriate to overcome any non-conscious posturing of the participant (e.g. an employee self-reporting job satisfaction in a survey distributed by their organization (Leavitt, Fong et al., 2011)).

One study indirectly measured mindfulness by assessing the disparity between implicit and explicit levels of self-esteem (Koole et al., 2009). They postulated that individuals higher in mindfulness would have less divergence between the two levels. Grossman (2011) suggests that mindfulness self-reports would benefit more from asking individuals to report how much they value characteristics and behaviors associated with

mindfulness instead of how skilled they are in these respects. Another implicit measure might involve observing the level of self-criticism a participant expresses while completing a difficult, present-moment oriented task. Other alternatives include Frewen et al.'s (2014) method of Meditation Breath Attention Scores, which counts the number of times an individual is on task when meditating. Sauer et al., (2013) suggest researchers embrace alternatives like qualitative approaches, biological and neurological feedback, assessment from others in addition to self-report measures, language-based measures or content analysis (e.g. Collins et al., 2009). Given the noted difficulties with self-report mindfulness, common method bias, construct validity and the complexities of measuring mindfulness altogether, incorporating alternative measures may benefit future research.

Experimental and Intervention Research

State mindfulness tends to be studied using experimental and intervention designs. The majority of mindfulness experiments employ mindfulness based interventions (MBI) that are largely based on a variation of Kabat-Zinn's (1994) Mindfulness-Based Stress Reduction program (Chiesa & Serretti, 2009; Grossman, Niemann, Schmidt, & Walach, 2004) or a selective portion of it. As such, a chapter in this book has been dedicated to MBIs (see Alberts & Hulsheger in this book). In general, there are three categories of experimental designs used in mindfulness studies: pre-experiments, quasi-experiments, and pure experiments.

Pre-experiments are experiments without control groups that use pre and post comparisons to capture the effects of a particular treatment (Campbell, 1975). Some have suggested that a lack of control groups is too common in current mindfulness

practices (Chiesa & Serretti, 2011). We maintain that incorporating control groups is advisable wherever possible. There are various types of control groups a mindfulness study could incorporate: no-treatment controls, wait-list controls (e.g. Fredrickson, 2008); passive controls (e.g. mind-wandering exercises, Arch & Craske, 2006; Kiken & Shook, 2011; and mental silence, Manocha, Black, Sarris & Stough, 2011); active controls (e.g. relaxation training (Josefsson, Lindwall & Broberg, 2014; and yoga (Sauer-Zavala et al., 2013); or perhaps a placebo where a group of participants nap in lieu of treatment.

Quasi-experiments use control groups, but not random assignment (Mark & Reichardt, 2004). A lack of random assignment threatens the internal validity of the study since it is possible that groups are not comparable at baseline (Boruch et al., 2004) or that some bias may compromise the objectivity of the study. A recent meta-analytic review (de Vibe et al., 2012) examined 31 MBSR studies and found that the overall risk of bias was high for almost one third of the studies and urged authors to better report randomized controlled trial procedures (i.e. randomization, allocation, blinding). To suggest that randomization is important would be trite; however, in many cases, random assignment is not possible given participants are self-selecting into the study. Despite this issue, quasi-experiments provide reasonable estimates as to the causal impact of the intervention on the population under study (Mark & Reichardt, 2004).

Pure experiments are those that are fully randomized between an experimental group and a control group (Boruch et al., 2004). In many disciplines randomized controlled studies mark the gold standard of experiments and mindfulness scholars should strive for such designs. An example of a well-executed intervention experiment conducted in the workplace is a study on the effects of meditation on work stress and

anxiety (Manocha, Black, Sarris & Stough, 2011). The authors employed a 3-arm randomized controlled trial designed to compare two interventions (mental silence n=59; relaxation techniques n=56; and control group n=63). 178 Subjects were assigned to a group using a blindfolded lottery allocation system and they were instructed not to disclose their method of meditation to other participants or researchers involved in the study. Participants completed surveys to establish their baseline psychological profile before intervention and again five to seven days after the end of the eight-week program. Classes were held in similar rooms within the same institution, and at the same time. All meetings were matched for duration, breaks, and periods of time between sessions. Results found a significant improvement for the meditation group compared to both the relaxation and the waitlist control group in psychological strain and depression scores.

Imbued within these categories of experimental designs are several limitations that researchers should be aware of when designing an experiment or intervention study. These are discussed in the following section.

Limitations of Experimental and Intervention Research

Experimental Design and Comparison Groups. When structuring comparison groups, the research question and context should drive the study design. Wait-list controls may be attractive to researchers in instances where recruiting sufficient numbers of participants for long studies is arduous. Wait-list controls may also appeal to those conscious of ethical and face-validity concerns with using placebo controls or “sham meditations” (Fredrickson et al., 2008: p. 1047) on participants that have been attracted to the study with expectations to receive some form of mindfulness training. Passive controls, like mental silence or mind wandering exercises, allow for a comparison of

multiple states of mind. Another option is the use of active control groups (ie. yoga, relaxation training). Indeed, research from clinical literature highly advocates for the use of active controls in mindfulness research (MacCoon et al., 2013) in the event other factors (i.e. social gatherings) are confounding effects. When evaluating the efficacy of mindfulness, matching as many conditions with an active control will aid in testing and isolating the active ingredient in the intervention (MacCoon et al., 2013). Although active controls require more resources and add another layer of complexity to experimental designs, they may help to circumvent experimental confounds related to the influence of other mental, emotional and physiological benefits associated with mindfulness.

Internal validity. In experiments, even though an effect can be attributed with considerable confidence to the intervention, attributing causality specifically to mindfulness can nevertheless be difficult. Some argue that the effects of an intervention may be a result of other factors (e.g. self-control exercises) and any effects may result from an innumerable list of other causes (Masicampo & Baumeister, 2007; Nyklicek & Kuijpers, 2008). Consider for example the possibility that participants appear to be more mindful because they are more rested, and consequently alert, in the period of testing following the intervention. Or, in another case, perhaps participants show improved focus simply from harnessing their will power.

A recent meta-analysis on the effects of mindfulness meditation found that MBSR's curriculum had a larger positive effect on psychological well-being compared to solely practicing meditation training techniques (Eberth & Sedlmeier, 2012). They theorized that the psychosocial nature of MBSR's group meetings, the educational

component, and expectations that the program could reduce stress – as its name implies – might amplify its effects. When designing an induction then, the methodology should distinguish between meditation types along with a rationale as to why that particular type was selected to show the linkages between cause and effect and potential confounds. Pinpointing the mechanisms of interest and systematically varying the elements in a mindfulness intervention is one way to choose the type of mindfulness practice and establish a stronger case for causality.

External Validity. Findings from laboratory experiments may be criticized for their applicability to broader situations. Methodologically, intervention studies in the field exhibit stronger external validity by bringing experimental aspects out into the natural environment. While it has been said that field experiments in organizational mindfulness research are scarce (Dane & Brummel, 2014) they appear in the literature more often than in other areas of organizational research, which largely feature laboratory experiments. Presently, any scarcity of mindfulness field interventions may be related more to the overall nascence of mindfulness research. Indeed, we find the relatively frequent use of field interventions in workplace mindfulness research laudable. As with any field intervention, there are challenges related to accessing organizations, recruitment, compliance, and attrition. Furthermore, complications ensue when coordinating schedules and garnering sufficient executive-level and management buy-in to support individuals taking time to practice mindfulness.

Systematic Variation and Standardization. Given the frequency with which interventions are used, researchers might consider invoking some standardization and systematic variation of intervention components in their design to ensure greater internal

validity. Calculated attention to the content and duration of experimental design would do just that. An ordered approach to intervention procedures is thought provoking as there are endless conceivable permutations. Here we discuss three key areas: systematic study of temporal variation, meditation type, and mode of program delivery.

Temporal Variation. Temporally, an intervention may be as long as eight weeks (e.g. MBSR training), or as brief as five days (e.g. Tang et al., 2007). Presently it is unclear why some interventions are more effective than others, or what components of an intervention – content, level of interaction, program duration, amount of class contact or home practice hours – have the most impact on participants. One study suggested that interventions intended to boost well-being and reduce psychological symptoms in a working population would be more effective if they were longer than four-weeks and spanning at least seven sessions (Josefsson, Lindwall, & Broberg, 2014). While there is evidence that actual time spent practicing mindfulness techniques is commensurate with enhanced affective experiences (Carmody & Baer, 2008; Shapiro et al., 2008), it remains inconclusive what the optimal length of a program should be.

Presently, the relationships between in-class contact hours and mean effect sizes are unclear (Carmody & Baer, 2009). More data is required to understand why some studies find significant positive associations between practice time and outcomes (Carmody & Baer, 2008), and others do not (Davidson et al., 2003). Similarly, short mindfulness inductions in some studies have had success in manipulating mindfulness levels (Reb & Narayanan, 2013) whereas others (Ruedy & Schweitzer, 2011) have not. Systematically categorizing mindfulness interventions and identifying temporal checkpoints would allow for apple-to-apple comparisons. In this way, differences in

mindfulness programming and any emergent or aggregate effects of a sustained practice could be better understood.

Type of Meditation. Meditation practices differ widely by origin, for example, Tibetan Buddhist, Zen Buddhist, Taoist Buddhist, Vedic, and Chinese traditions. Lutz and colleagues (2008) argue that it is essential to distinguish the type of meditation practice for neglecting to do so would be like using the word “‘sport’ to refer to all sports as if they were essentially the same” (p.163). Deciding which type of meditation tradition, program, or technique to use is another point of variability as different approaches may yield varying effects (e.g., Baer, 2003; Chiesa & Serretti, 2011). Using mindfulness as an all-encompassing construct makes poor use of prior research that has distinguished that there are measurable differences among the multiple aspects of mindfulness.

MBSR is mainly based on three techniques: Hatha Yoga, sitting meditation and body scan (Kabat-Zinn, 1990); yet, even these three practices may have different outcomes. Sauer-Zavala and colleagues (2013) divided 141 undergraduates into three mindfulness conditions: yoga, body scan, and sitting meditation. Psychological well-being was enhanced most in the yoga condition; emotion regulation improved for both the yoga group and the body scan; and those in the sitting meditation condition were associated with the greatest increases in non-evaluative perspectives.

A further distinction among meditation practices is whether they can be categorized as focused attention, a voluntary focusing of attention on a chosen object, or open monitoring, a practice of non-reactive monitoring of experience as it unfolds (Lutz et al., 2008). Automatic self-transcending has been proposed as a third category that

involves techniques encouraging transcendence, in other words a meta-experience, of one's own activity (Travis & Shear, 2010). We know that different parts of the brain are engaged in open monitoring compared to focused attention meditation (Lutz et al., 2008) and that these three meditation categories can be characterized by different brain wave patterns (Travis & Shear, 2010). Mindfulness researchers should make efforts to understand the implications of these differences when designing their own studies.

The experiences that a participant has in an intervention and the study's ensuing outcomes may vary by the participant's level of expertise (Grossman, 2008; Baer, 2011). While unguided meditations may have powerful effects for advanced practitioners, even ten minutes of breath meditation may be excruciating for a beginner. As such, body scans, characterized by their frequent instruction, may be more practical for wider audiences (Koole et al., 2009). Since the measurement of mindfulness may be confounded by the individual experiences of the population (Masicampo & Baumeister, 2007), considering the participants and their level of expertise will help guide the experimental design process.

Mode of Delivery. In contrast to MBSR programs where participants meet weekly, other recent approaches use online or self-guided interventions (e.g. Hülshager et al., 2012). The convenience of a self-guided intervention is considerable given the contrast to lengthy, facilitated studies. Logically it follows that different modes of program delivery will have associated benefits and limitations. Consider the differences between guided meditations that are experienced online versus in-person: autonomy, interaction levels, compliance, and attrition to name a few. The mode of program delivery will affect facilitator credibility, group dynamics, and other context

effects (home vs. office practice). Studying the effects of such components as the time, length and location of sessions, intervals of data collection, facilitator skills, online or in-person sessions, and support materials used (e.g. handouts, home practice exercises, DVDs etc.) is a worthy endeavor.

Neuroscientific Research

A promising method for future research rests in neuroscientific approaches. The neurological effects of mindfulness and meditation have been examined in medical and psychological research for several decades. Neuroscientific studies may further ground mindfulness research in the workplace by offering insight into the mechanisms of mindfulness via neural correlates. Neuroscience has produced numerous findings that demonstrate patterns in neural activity showing how meditation affects cognitive functioning in the brain (Lutz et al., 2007, 2008; Cahn & Polich, 2006; Lazar et al. 2005). For instance, key cognitive mechanisms of breath-focused meditation can be directly mapped onto modern neuropsychology (Kudesia and Nyiama, in press).

In many cases, brain activity data is obtained using electroencephalography (EEG) or function magnetic resonance imaging (fMRI) to establish a brain profile. The EEG measures cortical and subcortical electrical activity by applying sensors either on the scalp or directly on the cortex. EEG metrics can be used to describe the frequency of the brain waves in different states (mindful vs. mindless) and in some studies, to categorize mental states during different types of meditation (Travis & Shear, 2010). Takahashi and colleagues (2005), for example, studied the effects of Zen meditation by observing brain-frequencies on EEG and heart rate variability. FMRI uses high-resolution imaging to compare reliable snapshots of different regions of the brain. This

method measures brain activity by capturing images of blood flow in the brain that represent neuronal activation. Thus, fMRI can be used to study which parts of the brain are being used and in what capacity. In this way Luders and colleagues (2009) compared the brain images of meditators against a group of non-meditators controlling for demographics such as age, gender, or length of time maintaining meditative practices.

Limitations of Neuroscientific Research

We appreciate that the field of neuroscience lends credibility to the advent of organizational mindfulness; however, we have two general cautions with fMRI and EEG methodologies. First, the complexity of fMRI technology and interpreting neuroimaging data can make it prone to false positives. The infamous study by Bennett and colleagues (2009) demonstrated that failure to correct for multiple comparisons in datasets could result in, astonishingly, finding brain activity in a dead fish. Second, relying on fMRI images presumes that the localized activation of a particular region of the brain can be conclusively associated with a particular behavior – a gross over-simplification of the brain’s complex operating system (Menon & Uddin, 2010); to explain behavior using neuronal activation explanations alone would be remiss.

Suggestions for Future Research

In a short time, research on mindfulness in the workplace has built a compelling case for the impact of mindfulness in organizational settings. In this section we put forth suggestions for further research that we hope will refine what is currently known, and guide researchers as they advance this body of literature. We present three areas to organize such pursuits: 1) developing a taxonomy of mindfulness and meditation to distinguish their key elements; 2) understanding the interactions of mindfulness across

individuals, groups and organizations; and 3) applying mixed methods approaches to capture the complexity and dynamism of mindfulness in the workplace.

Workplace mindfulness research would benefit greatly from the systematic analysis of mindfulness practices and their varying effects, potencies, and optimal configurations within organizations. Understanding the active ingredients, the expected outcomes of mindfulness practices, and the length of time such observed effects last is a worthy endeavor. Along these lines, it remains unclear if different mindfulness techniques (e.g. mindfulness meditation vs. Transcendental Meditation) have unique mechanisms specific to each practice (Chiesa & Malinowski, 2011; Tanner et al., 2009). In contrast to MBSR's (Kabat-Zinn, 1994) lengthy 8-week program, it would be interesting to systematically catalogue the efficacy of alternate programs in the workplace (e.g. dialectical behavior therapy, DBT: Linehan, 1993; acceptance and commitment therapy, ACT: Hayes, Strosahl, & Wilson, 1999; integrative body-mind training, IMBT: Tang, 2009). Future research might study the use of different mindfulness exercises and programs as intervention techniques and their effectiveness in manipulating mindfulness levels to yield specific outcomes in the workplace (Carmody & Baer, 2009).

A second area of future research is to explore how mindfulness manifests in response to the context and the interactions between individuals, groups, and organizations. Empirical studies that describe contextual or group level antecedents of mindfulness in the workplace are critical for advancing the case for mindfulness practices at work. Yet, we know little about the contexts where low mindfulness might be preferable (Dane, 2011), and whether such conditions are consciously induced or are a result of automatic processes. For example, can online clicking behavior be manipulated

by a website to induce a mindful (or mindless) state that impacts purchasing patterns or task performance? Can mindfulness be induced to circumvent errors caused by automaticity in repetitive work settings? Should mindlessness be induced to help managers cope with the duress of impending layoffs? In addition to the impact that context may have on mindfulness in the workplace, research that examines the bottom-up and top-down effects of mindfulness in individuals, teams and organizations offer exciting areas for new insight.

It appears that aggregating a group of individuals high in mindfulness does not necessarily have additive properties (Chan, 1998) such that the group is also mindful (Leroy et al., 2013) but we know little about how a mindful organization might affect individual mindfulness, or how one very mindful team member might impact the group. One of the only multi-level studies we are aware of examined mindfulness at the individual and organizational level and the performance of financial advisors (Hensler, Lingham & Perelli, 2013). They found that more mindful advisors in more mindful organizations performed better in dynamic markets. The overall dearth of multi-level mindfulness research in the workplace leaves many questions unanswered. If an individual undergoes mindfulness training, is there a mindfulness effect that ripples over into the team or firm level? Would a mindful workgroup simply be a group of present-moment oriented and accepting individuals or would higher mindfulness levels alter group dynamics, communication patterns and shared mental models that result in higher functioning teams? At the group level, can mindfulness practices be used to enhance team effectiveness and cohesion? Additionally, in the wake of globalization, how might cross-cultural differences impact mindfulness in individuals and processes within multi-

national corporations? We encourage future research to pursue the validation of mindfulness as a multi-level construct (e.g. Chen, Matthieu, & Bliese, 2005) and examine how mindfulness operates at and between different levels of analysis.

Our final area of future research advocates for the use of mixed method approaches to study mindfulness in the workplace. Mindfulness is a rich and dynamic construct that makes research on the topic endlessly complex. Mindfulness can be depicted as attention and awareness but even attention can be categorized into ten developmental stages when drawing from contemplative texts, (e.g. Wallace, 2006). Just as a caterpillar can take the form of an insect, cocoon or butterfly, depending on the individual and their context, mindfulness may also appear in different forms. To this end, we encourage IO scholars to integrate qualitative and longitudinal approaches, and biofeedback data with traditional methods wherever possible.

Mindfulness stands to impact multiple facets of the human experience and conceivably, may take time to manifest. As such, quantitative data may not provide a comprehensive understanding of mindfulness in the workplace. Surveys and experiments conducted over shorter periods of time may not capture the peaks and valleys of meditation experiences (i.e. boredom, itchiness, anxiety, relaxation, tranquility or enlightenment). Interviews, open-ended questions, and journaling are effective ways that researchers could use to collect qualitative data. Surveys may be complemented with qualitative approaches (e.g. background and follow-up interviews) that capture the individual differences and phenomenological experience of participants (e.g. Dane & Brummel, 2014; Atkins & Parker, 2012) or experiential sampling methods that draw on many data points over time. Applying multiple approaches over time would allow for a

more holistic understanding of mindfulness and capture any curvilinear, non-polar aspects of mindfulness that can only be seen through frequent and extended observation. We fear that short-term studies using only quantitative data may miss the butterflies by fixating solely on cocoons.

As biofeedback technology becomes increasingly accessible, an exciting union between mindfulness research and cutting-edge technology is upon us. Whereas monitoring EEG signals was once a complex and costly process only feasible in laboratories, now thought-computing devices powered by EEG signals are available for mass consumption (e.g. Muse by InteraXon.ca). Such devices work by using sensors to pick up brainwaves, which are then translated into data that can be processed to, for example, turn on lights or close the blinds. We urge future research to consider the integration of neuroscience along with other biological data where psychologists hold a history of expertise (e.g. rapid eye movement, electrocardiogram, skin testing, blood chemistry, and vital signs) into their data collection. Along these lines, Lutz and colleagues (2008) have suggested a *neurophenomenological* approach (Varela, Thompson, & Rosch, 1991) to mindfulness research where individual accounts of firsthand experience are paired with quantitative neural methods. Smart phones present another fascinating point of access for researchers to apply experiential sampling methods. Consider the possibilities of combining smart phones with thought computing devices to collect neural data. Worthy of note are the ethical issues that may accompany the monitoring and harvesting of brainwave activity in the workplace. As mass amounts of neural data are acquired, organizational mindfulness scholars should stay aware of who is collecting the data, intended objectives, and the implications associated with

research findings. In sum, we put forth that mixed method approaches may offer a richer means of studying the different depths and forms of mindfulness.

Conclusion

The study of mindfulness is in its infancy and the pioneers of the field have contributed compelling findings that have demonstrated the potential far-reaching benefits. As interest from organizational scholars grows and this body of literature develops, we urge researchers to take heed that the study of mindfulness is as complex as it is alluring. This chapter began by reviewing how organizational scholarship has studied the different conceptualizations of mindfulness, and the related construct validity issues. Next we discussed the common methods of analysis and their limitations. Lastly, we proposed three general directions for further research that we believe hold great promise. We hope this chapter has helped describe the prevailing methodologies and their limitations to offer researchers a guide that leads to a more rigorous study of mindfulness in the workplace. In this way, together we advance the impact of mindfulness research in both theory and practice.

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