

Contemplative science comes of age:

Looking backwards and forwards 20 years after Baer (2003)


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A lot has happened in the 20 years since Baer (2003) published the first meta-analysis of mindfulness-based interventions (MBIs) in *Clinical Psychology: Science and Practice*. The year 2003 was a time before the iPhone, before Facebook, long before the COVID-19 pandemic, and certainly before advances in artificial intelligence brought algorithm-delivered content to our digital devices and large language models could mimic human interaction disturbingly well. Yet, Baer's meta-analysis examined the effects of MBIs on the same clinical challenges that plague us today: depression, anxiety, stress, pain. In 2003, self-compassion was only just emerging as a term in the scientific lexicon and experimental work studying interventions based on loving-kindness and compassion meditation (LKCM) was still almost a decade away (Neff, 2023).

Since 2003, hundreds of randomized controlled trials (RCTs) have tested MBIs for a vast array of clinical and non-clinical outcomes, in a wide variety of populations and across the globe. Although with some variability across outcomes and populations, MBIs reliably produce reductions in measures of psychological distress and may benefit some indices of physical health (Goldberg, 2022). At least somewhat a result of the scientific investigation of mindfulness, MBIs have been embraced across key domains of Western society (e.g., healthcare, education, work).

As demonstrated in Authors et al. (in press) meta-analysis, great strides have been made in our scientific understanding of LKCM. Indeed, LKCM appears to produce effects at least on self-compassion that are similar (or larger) in magnitude those seen for MBIs on measures of psychological distress: $d = 0.81$ versus passive controls and $d = 0.23$ versus active controls. The magnitude of these effects and, in particular, the superiority to active controls on measures of self-compassion highlights the potential of this approach (Neff, 2023).

Now that the LKCM literature has grown large enough to allow large-scale meta-analyses like that conducted by Authors et al. (in press), it seems an opportune time to look towards the

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MBI literature – looking backwards for lessons learned and looking forwards for innovations on the horizon – to help guide the younger but no less promising field of LKCM research.

Looking Backwards: Lessons Learned from MBIs

Run Larger Trials

There has been growing recognition of the drawbacks of small sample studies within neuroscience and psychology in the past decade. Small samples provide unreliable estimates of treatment effects and, when coupled with publication bias, can produce biased meta-analytic estimates. Although publication bias was not detected by Authors et al. (in press), trim-and-fill analyses can themselves be underpowered particularly in the presence of high heterogeneity (which was certainly true in this case, $I^2 = 98.60\%$). Aside from biased overall effects, small samples also limit one's ability to conduct properly powered tests of mediation and (even more so) tests of moderation within the primary trials. Short of being able to combine individual participant data from across many studies to conduct these tests (which will be discussed below), a smattering of tests of mediation and moderation leaves those conducting systematic reviews and meta-analyses largely unable to draw definitive conclusions about key aspects of the literature: how LKCM works (i.e., mediation) and for whom it works best (i.e., moderation).

To be fair, the MBI literature has not established definitive evidence for how and for whom MBIs work (Goldberg, 2022), but there is evidence that trials are getting larger (Goldberg et al., 2017) and some very large-scale trials have been run in recent years (e.g., the MYRIAD trial). In the current meta-analysis, only two of the LKCM RCTs had more than 100 participants in the LCKM group. Running larger RCTs requires substantial resources. Hopefully, there will be greater opportunities for funding larger studies as the clinical relevance of LKCM clarifies.

Test LKCM for Clinical Outcomes in Clinical Populations Using Gold-Standard RCTs

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A major contributor to the dramatic increase in scientific and popular interest in MBIs has been the application of these strategies to address issues important to public health. We see this in the origin of secularized MBIs with an initial focus on treatment-resistant chronic pain. This thread has continued notably through the development and testing of mindfulness-based cognitive therapy (MBCT) for depression (and more recently through the application of mindfulness strategies for the combination of chronic pain and opioid misuse in the case of Mindfulness-Oriented Recovery Enhancement [MORE], among many other examples). MBCT identified an intractable clinical issue (the relapsing nature of major depression) faced by large swaths of the population and contributing substantially to decrements in public health (depression is one of the largest contributors to the global burden of disease). The developers of MBCT conducted large-scale clinical trials, comparing MBCT with gold standard treatments (e.g., antidepressants) and measuring clinical outcomes over long periods of time (e.g., 12 months). The resultant literature has provided clear evidence supporting the efficacy of MBCT (Goldberg, 2022) which has led to its recognition as an empirically-supported treatment (e.g., by the American Psychological Association's Society of Clinical Psychology) and its adoption within the National Health Service in the United Kingdom.

It is certainly valuable to better understand how LKCM impacts self-compassion, particularly given the strong link between this construct and mental health (Neff, 2023); authors et al. (in press) have provided this in their meta-analysis. But for LKCM to fully achieve its potential public health impact, we will need treatments, trials, and meta-analyses that explore the clinical effects of LKCM. The smaller effects observed for RCTs of clinical populations in the current study, although based on a fairly small number of studies ($k = 10$), leaves open the question of whether LKCM is indeed less effective at improving self-compassion in clinical

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samples or whether we simply have not developed and tested LKCM interventions that harness these techniques in ways that are most helpful for clinical populations.

Measure and Report Indices of Harm

The MBI literature has been guilty of devoting insufficient attention to studying the unintended and potentially negative effects of our treatments. Although MBI researchers are not alone in this (psychotherapy researchers share the same guilt), the time has come to consistently measure and report potential harm and adverse effects that can result from meditation training. There is evidence that both mindfulness and LKCM, when practiced intensively, can produce dramatic and at times disruptive changes in psychological functioning. It also appears that less intensive meditation training can have negative effects, at least for a proportion of the population. It is incumbent upon researchers – clinical trialists and meta-analysts alike – to take these concerns seriously. This requires the development of measures that are sensitive to the kinds of negative effects that contemplative practices like mindfulness and LKCM can produce. Until such measures are validated and available, a method for examining one aspect of harm that LKCM clinical trials can employ in the meantime using their existing data is investigating the degree to which random assignment to LKCM is associated with greater risk of symptom worsening relative to a control condition. In addition to being feasible to conduct with existing data, this approach also has the advantage of allowing causal claims. That is, it is possible to determine whether random assignment to LKCM resulted in a greater likelihood of symptom worsening (or perhaps a decreased likelihood of symptom worsening, indicating protective effects as has been observed in some instances for MBIs; Goldberg, 2022).

Looking Forwards: Innovations and Future Directions for Contemplative Science

Investigate Scalable, Context- and Participant-Responsive LKCM

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As noted above, the dramatic advances in digital technology that have occurred in the past 20 years were unavailable to the developers of early MBIs. Now, the potential for digital technology to expand access to evidence-based strategies including contemplative practices like mindfulness and LKCM could not be clearer. Among mental health apps, mindfulness has emerged as far and away the dominant content among active users (Goldberg, 2022). And, of course, many of the most popular meditation apps include a combination of mindfulness and LKCM (e.g., Headspace).

In our view, MBIs and LKCM stand together at the threshold of dramatic new possibilities for the use of technology to promote health. Existing digital health tools have been important in expanding access to these techniques largely through audio- and video-guided meditation practice. Guided practices provide access to some foundational elements of contemplative interventions – instruction in the meditative techniques themselves – but they far from exhaust the possibilities of what these tools might do.

Increasingly, meditation apps include features that provide some of what is lost in the digital format: opportunities to connect with other practitioners through direct messages and discussion boards, visualizations that display how many others are meditating simultaneously, synchronous live-streamed classes with instructors. Yet, the real potential of these tools may not just be scaling the in-person elements of meditation training, but ultimately moving beyond the limitations of traditional contemplative interventions. For example, currently many meditation apps include digital features to track usage (e.g., monitoring practice “streaks”) and to set practice reminders. Although simple examples, these features may be powerful supports for developing a meditation habit. While the digital format may lack some of the juicy interpersonal elements that are therapeutic across psychological interventions (e.g., therapeutic alliance, group

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cohesion), they may be able to compensate at least partially through these digital features. Audio-delivered, digitally-guided instruction also provides opportunities for “active” meditation practices while engaging in routine activities of daily living such as commuting, cleaning one’s home, and even physical exercise. These innovations may support establishing a daily practice, even in the absence of formal periods of practice.

In our view, we are truly at the beginning of understanding and harnessing the power of digital technology to influence health. Most adults in the United States have a device within arm’s reach at all times that has the computing power to not only passively monitor features directly linked to mental and physical health (e.g., movement, social interaction, facial expression) but also to deliver interventions that can promote mental and physical health. Clearly these tools are an important part of the future of contemplative science. To usher contemplative science into the digital age, there are many important scientific questions to answer: What can we passively measure through smartphones and smartwatches that could inform intervention delivery? What interventions can be effectively delivered in the moment? How can we incorporate context- and participant-specific features into the delivery of interventions? We think these are exciting and genuinely open questions and ones that mindfulness, LKCM, and other contemplative practices may play an important role in answering.

Move Beyond Self-Report

The effects of LKCM have mostly been explored using retrospective self-report measures like the Self-Compassion Scale (Neff, 2023). While such studies have been informative, they are inherently limited by demand characteristics and other biases. Objective, non-self-report measures may have increased validity, including in clinical contexts. For example, prospective objective measures of childhood adversity are better predictors of structural brain anomalies in

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adults than retrospective self-reports of adversity (Gehred et al., 2021). One means of removing some of the biases that plague self-report measures is to obtain “second person” measures. By asking a significant other who knows the subject well, we may obtain more ecologically valid measures of the qualities that are said to be cultivated by LKCM which, like self-compassion, may be linked with clinical outcomes (e.g., kindness toward oneself and others).

It might also be beneficial to obtain more objective measures of the clinically-relevant processes that are assumed to be influenced by self-compassion, such as emotion regulation. There is a plethora of objective physiological measures of emotion regulation including facial EMG and fMRI. The impact of LKCM on altruism, kindness, and prosocial behavior has also been captured in behavioral measures derived from behavioral and neuroeconomics (e.g., response to a redistribution [dictator] game). Such measures involve decision making tasks with typically monetary outcomes (though in younger subjects, more age-appropriate incentives have also been used). LKCM is also hypothesized to reduce bias among members of outgroups and the impact of such training on behavioral measures of implicit bias has been documented.

Use Individual Participant Data Meta-Analysis to Identify Mediators and Moderators

Aggregate data meta-analysis can be a powerful method for understanding the magnitude of effects within a given literature. However, this meta-analytic approach is often less effective at answering questions of how and for whom a given intervention works (i.e., mediation and moderation). While tests of moderation can be conducted at the study level (Authors et al., in press), these tests are notoriously underpowered and lose granularity when all participants in a study are represented by a single effect size.

Increasingly, meta-analysts have been able to collaborate with clinical trialists to access individual participant data. This process can be challenging (e.g., getting the attention of busy

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principal investigators, sorting out the regulatory details necessary for sharing clinical trial data, harmonizing data across trials). However, the scientific advantages of individual participant data meta-analysis over traditional aggregate data meta-analysis may be worth the trouble. Individual participant data meta-analyses have begun to appear in the MBI literature, yet they remain the minority of the meta-analyses being published (Goldberg, 2022). We hope that the era of open science and mandated data sharing by some funders (e.g., National Institutes of Health) will greatly support efforts in this area. Ultimately, the inclusion of common data elements across studies (e.g., standard sets of demographic characteristics, clinical outcomes, candidate mechanisms) will allow future meta-analysts to not only more robustly characterize overall effects by standardizing the analytic approach (e.g., handling missingness consistently across trials) but also to test mediation and moderation with adequate power. These combined data sets may lend themselves to data-intensive approaches for understanding what works for whom (e.g., machine learning) that are challenging to pursue outside large RCTs. Key questions for the field and public health – such as the degree to which contemplative interventions are effective across demographic subgroups and the ways in which contemplative interventions could be used and adapted to address health disparities – could be directly informed by these kinds of analyses.

Conclusion

In the last 20 years, MBIs have moved from the fringe to the mainstream of both science and society. As is clear from Authors et al. (in press) meta-analysis, LKCM is not far behind. In our view, the rigorous scientific exploration of LKCM could not be timelier. By some metrics, human civilization has entered an unprecedented era, one marked by widespread social dislocation, political polarization, vast social and economic inequalities, and existential uncertainty related to the very planet on which we live. Anticipating the difficulties ahead, our

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ability to be supportive toward ourselves (i.e., self-compassion) as well as our ability to be supportive toward others during difficulty is certainly relevant. Moreover, the broad range of contemplative practices offer strategies to train a variety of mental habits that may serve humanity in the decades to come. This exploration moving forward on firm scientific grounding will require the kind of rigorous inquiry Authors et al. (in press) are engaging in. We hope that by responding to the lessons learned from MBI research and embracing the potential futures shared with MBI research, we can collectively maximize the therapeutic potential and minimize the therapeutic risks of contemplative practices for the benefit of all.

References

- Authors (in press). Effects of loving-kindness and compassion meditation on self-compassion: A systematic review and meta-analysis. *Clinical Psychology: Science and Practice*.
- Baer, R. (2003). Mindfulness training as a clinical intervention: A conceptual and empirical review. *Clinical Psychology: Science and Practice*, 10(2), 125-143.
- Gehred, M. Z., Knodt, A. R., Ambler, A., Bourassa, K. J., Danese, A., Elliott, M. L., ... & Caspi, A. (2021). Long-term neural embedding of childhood adversity in a population-representative birth cohort followed for 5 decades. *Biological Psychiatry*, 90(3), 182-193.
- Goldberg, S. B. (2022). A common factors perspective on mindfulness-based interventions. *Nature Reviews Psychology*, 1, 605-619. doi: 10.1038/s44159-022-00090-8
- Goldberg, S. B., Tucker, R. P., Greene, P. A., Simpson, T.L., Kearney, D. J., & Davidson, R. J. (2017). Is mindfulness research methodology improving over time? A systematic review. *PLOS ONE*, 12(10), e0187298. doi: 10.1371/journal.pone.0187298
- Neff, K. D. (2023). Self-compassion: Theory, method, research, and intervention. *Annual Review of Psychology*, 74, 193-218.