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Residential meditation retreats: their role in contemplative practice and significance for psychological research

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Contemporary investigations of mindfulness and meditation have predominately emphasized the short-term effects of brief inductions or standardized, multi-week interventions in people with little to no prior meditation experience. Considerably less is known about the effects of continued or intensive meditation practice as proficiency and expertise are acquired over time. In this article, we describe the form and function of residential retreats, an understudied class of meditation intervention that holds promise for bridging this gap in the empirical literature. We outline a number of design features that distinguish retreats from other meditation-based interventions, and highlight their utility for informing functional and developmental perspectives on meditation, cognition, health, and well-being.

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Current Opinion in Psychology 2019, 28:238–244

This review comes from a themed issue on **Mindfulness**

Edited by **Amit Bernstein, Dave Vago** and **Thorsten Barnhofer**

For a complete overview see the [Issue](#) and the [Editorial](#)

Available online 7th January 2019

<https://doi.org/10.1016/j.copsyc.2018.12.021>

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In its broadest sense, meditation practice can be regarded as a lifelong path of personal growth and development. Meditators may spend years or even decades training in diverse techniques [1,2**] designed to strengthen attentional capacities, facilitate insight, or foster beneficial qualities of body and mind. Indeed, from this vantage, meditation can usefully be framed both as a family of mental training *techniques*, and as a progressive and iterative *process* of learning and self-inquiry: over time, and with dedicated practice, it is alleged that meditation practitioners can learn to cultivate specific mental faculties conducive to the alleviation of suffering, and to enduring improvements in psychological well-being [1,2**].

Though they are commonly endorsed by experienced Buddhist teachers and modern training manuals [3–7], developmentally oriented perspectives on meditation have seldom appeared in the psychological literature (though see Slagter *et al.* [8*], for a notable exception). Instead, contemporary research has tended to focus on the outcomes and efficacy of meditation interventions, rather than process-oriented theories of individual transformation and change. The vast majority of recent work, moreover, has centered on brief, non-intensive, or standardized (often clinically oriented) interventions in meditation-naïve participant samples [9–13]. These designs lend themselves to a relatively high degree of operationalization and experimental control, which are important when the goal of research is to isolate component mechanisms of mindfulness techniques [14,15**], or to establish their clinical viability [16,17**]. However, these approaches can lack ecological validity with regard to the values, principles, and practices of experienced meditators out in the world. Likewise, cross-sectional studies of meditation adepts can offer valuable knowledge about highly experienced practitioners [e.g. Refs. 18,19], but provide limited information about how this expertise develops or is acquired over time.

Residential retreats are an important training component of many people's ongoing meditation practice and, accordingly, they offer an ecologically valid research strategy for bridging empirical gaps between non-intensive interventions in novices and cross-sectional studies of expert practitioners. Here, we advocate for the increased use and interpretation of intensive retreat interventions as model systems for studying the transformative effects of meditation on cognition, physiology, and well-being in committed practitioners over time.

Structure and function of residential retreats

Residential retreats provide meditators with a physical space and supportive environment for undertaking concentrated periods of practice for days, weeks, or months at a time [20]. Much like enrolling in an immersion course when learning a second language [21], retreats afford individuals the opportunity to progress in their meditation training to a greater extent than ordinarily possible among the distractions and obligations of everyday life. Motivations for attending retreats include the desire to gain proficiency in particular meditation techniques; to progress along a chosen spiritual or soteriological path;

to recover from or cope with stressful life events; or as a means of leisure-based self-improvement [22,23].

The structure of residential retreats varies across contemplative traditions, practice styles, and cultures. Here, we focus on a number of elements common to retreat interventions studied in the psychological literature [e.g. Refs. 24–26,27*,28*]. Perhaps the most salient of these features is the rigorous daily schedule of formal meditation practice, which typically ranges from 6 to 11 hours a day. To support this concentration of practice, practitioners reside at a meditation center or other retreat setting, often located in a serene natural environment, where they are secluded from the distractions of day-to-day life, eat a simplified diet, and have their basic needs provided for. They receive guidance from experienced teachers or community members, and social support from a group of similarly motivated individuals. Practitioners also adhere to behavioral regimens of self-regulation to help limit distraction, relax the body and mind, and facilitate continued awareness to ongoing experience. A notable example is that retreats are often held in silence, wherein participants refrain from speaking, communicating, or initiating eye contact with others. Other behaviors commonly renounced on retreat include the use of electronic devices or media, the use of intoxicants, and sexual activity.

Critically, the structure of retreats blurs the boundary between formal and informal modes of practice. Formal practice refers to defined periods of time in which practitioners engage with a specified meditation instruction or technique while assuming a particular physical posture (sitting, standing, walking, or lying down). Practitioners are also encouraged to extend their practice, less formally, into other daily activities, such as eating meals, performing chores, and transitioning into and out of formal meditation sessions (see Box 1). As such, retreats are designed to facilitate uninterrupted attention and reflective awareness toward ongoing mental and sensory phenomena. This training structure expands the definition of meditation—often conceptualized as a delimited, formal activity—into an embodied and intentional stance toward experience [2**,3,29] that informs one's values, ethics, and attitudes in all areas of life.

Empirical studies of intensive interventions

To the degree that meditation reflects a process of training and development, then many, if not most, of the effects conventionally ascribed to mindfulness-based practices will likely depend on (a) the *intensity* of daily practice regimens, (b) the *duration* of a typical training program, and (c) the *experience* backgrounds of the participants who engage in them. As illustrated in Figure 1, retreats can differ substantially from other, more

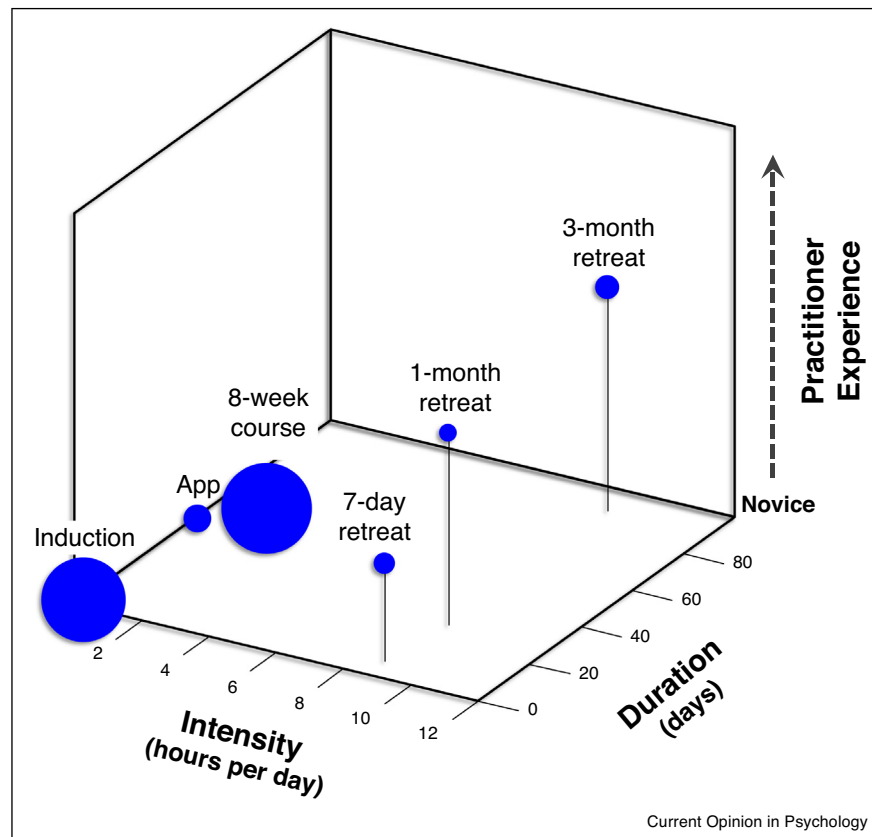
Box 1 Modes of contemplative practice on retreat

- **Sitting meditation:** practices with formalized or structured instructions done in a still, seated posture. As an example, take the practice of *settling the mind in its natural state* [6], in which attention is drawn to the subjective space where discursive thoughts and mental images arise. Practitioners are encouraged to observe the flux of their ongoing mental events, while remaining vigilant for distractions. Awareness is deliberately and repeatedly brought to bear on the contents of experience in order to cultivate attentional stability and meta-awareness [2**], and to facilitate insight into the ephemeral nature of one's identity.
- **Walking meditation:** an alternative to sitting meditation, used to initiate the transition of meditation practice into everyday activities [4]. Walking meditation can be practiced formally, by pacing slowly back and forth along a designated path, or informally as one moves throughout the day. Awareness is drawn to changes in intentionality, proprioception, and somatosensory experience as one lifts one foot, initiates forward movement, touches the foot to the floor, and shifts weight in preparation for the next step.
- **Eating meditation:** a more informal practice engaged in during meals. One notes the cascade of sensations that arise with each mouthful of food—the motor actions required to draw food to the mouth, chewing motions and salivary responses, and the texture and taste of each bite. Practitioners can use eating meditation as an opportunity to reflect upon the circumstances and efforts that have brought food to their plates.
- **Work meditation:** the practice of completing chores with present-centered awareness and intentionality. Practitioners may prepare meals, clean common areas, or ring bells to signal the beginning of formal sessions. Work meditation can be used to foster a sense of shared purpose and community, and to further integrate mindfulness into daily activities.

frequently studied meditation interventions along each of these dimensions. By design, retreat interventions require a more intensive daily practice schedule than do standardized mindfulness courses (such as the eight-week mindfulness-based stress reduction [15**]) or single-session induction procedures. Retreats will also tend to include participants with greater cumulative practice experience than non-intensive interventions, which recruit almost exclusively from novice or inexperienced populations. The duration of residential retreats, however, can vary widely, with published studies being both shorter (e.g. Ref. [30]) and longer (e.g. Ref. [28*]) than standardized eight-week courses.

Despite their potential to inform contemplative research and theory, retreats comprise only a small percentage of the ever-increasing corpus of studies on mindfulness-based interventions (Figure 1; see also Ref. [20]). This can be ascribed, in part, to logistical challenges and interpretive issues that arise when researchers must rely on well-structured active comparison conditions in order to draw inferences regarding specific mechanisms of action (see Box 2). However, as reviewed here, retreat interventions can be of strategic research benefit for identifying the boundary conditions or dosage requirements needed to effect change in a given outcome; for establishing the scope or domain

Figure 1



Design attributes of meditation interventions in the empirical literature. Meditation interventions are mapped according to (a) hours of formal practice per day, (b) duration in days, and (c) meditation experience of typical participant samples. The parameters plotted for single-session induction protocols, non-intensive standardized (8-week) courses, and mobile-based (App) interventions are loosely based on recent meta-analyses [9–13]. Retreat parameters are based on the following empirical studies: [24,25,27*,28*,31,38]. The dimension of practitioner experience reflects a hypothetical composite that encompasses cumulative lifetime hours of experience, total years of experience, and number and length of completed retreats. The circle size represents the relative proportion of articles published on each intervention type, based on a brief but non-comprehensive survey of the literature. All estimates are purely illustrative and are offered for heuristic purposes only. The heuristic is limited to examples of longitudinal studies involving preassessment and postassessment measurements, and does not include cross-sectional studies of adepts or long-term meditators. In addition to the dimensions pictured, meditation studies will further differ on other important design dimensions, such as the style or tradition of practice [1] and the research emphasis on state versus trait effects [16].

specificity of training effects; and for understanding the holistic or integrative effects of meditation training at the individual level.

To date, retreat studies have most consistently been used to interrogate the effects of concentrated practice on attention training and cognitive skill acquisition, and the neural changes that accompany them [25,26,28*,31–38]. One traditional claim is that practitioners' ability to focus attention for extended time periods will increase commensurate with acquired expertise [2**,6]. In our own work, we have investigated this claim in both a one-month Insight retreat [38] and in a three-month shamatha retreat [33,35] using continuous performance tasks of sustained attention and response inhibition. Across both studies, practitioners improved in

performance accuracy and showed a diminution of the vigilance decrement—the decline in task performance that occurs when difficult perceptual discriminations must be made continuously over time. As might be expected, greater performance improvements were observed during the first half of the three-month-long retreat than during the second half [28*,33], a pattern that mirrors alterations in state-related brain oscillatory activity when these same participants engage in focused attention meditation [34]. Because similar improvements have not been observed when these same attentional tasks are used in non-intensive interventions [39,40], the available evidence suggests that a relatively high dose (or concentration) of practice may be needed to obtain reliable changes in sustained attention, but that rates of improvement may then temper as meditation experience

Box 2 Control and inference in intensive interventions

A perennial problem in meditation research concerns the design and implementation of appropriate control and comparison conditions for experimental inference [15**,16]. In the case of residential retreats, random assignment and the use of credible active comparison interventions is often fiscally or logistically infeasible, leading most investigators to rely on uncontrolled studies [31,41,43], passive control groups [25,27*,38], or waiting-list designs [28*]. For longer retreats, it can be difficult to devise active comparisons, in which similarly experienced controls reside onsite but do *not* practice meditation for weeks or months at a time [cf. vacation control, 54]. Moreover, prior experience, interest, or dedication to training are assumed to be necessary preconditions for retreat practice, raising ethical questions as to the appropriateness of true randomization in this context.

Retreats also include design elements beyond formal practice components (i.e. diet, environment, silence) that might proportionally account for certain outcomes (e.g. Ref. [55]). Because retreats function as holistic and integrative interventions, it is unlikely that any single control condition can comprehensively account for these nonspecific factors, as has been attempted with some success for non-intensive interventions (e.g. Health Enhancement Program [16]); and it is currently unclear to what extent formal practice can be conceptually dissociated from passive or informal training elements on retreat. As such, it is often most appropriate to draw inferences regarding the effects of retreats *as a comprehensive whole*.

The inferential challenges inherent to retreats are shared by other natural and quasi-experiments, and researchers should look to these domains for methodological guidance. Research on aging, for example, has generated substantial replicated knowledge on how cognitive processes develop from childhood to older age, despite these studies being largely correlational or quasi-experimental in design. In addition to contrasting interventions of different intensities or practice styles, [e.g. Refs. 26,32], future studies should bolster their experimental inferences by emphasizing strong within-subject longitudinal designs; by utilizing correlational procedures to attribute outcomes to specific retreat elements (e.g. practice duration); and by directly assessing alternative explanatory variables that cannot be readily controlled experimentally (e.g. motivation or expectancy).

is accrued. More work, including multi-assessment longitudinal designs, is needed to determine whether other cognitive outcomes also show non-linear patterns of change across retreat.

Retreats may also prove useful for understanding the effects of concentrated practice on biological markers of stress and health [30,41–43]. In a recent study of a month-long Insight retreat, we observed increases in immune cell telomere length—an important marker of cell aging—after only three weeks of intensive training [27*]. Retreat-related changes were also observed in the expression of a number of genes implicated in telomere maintenance. For a comparison group, we recruited similarly experienced meditators who had previously attended intensive retreats, but who were asked to maintain their typical, non-intensive practice at home for the duration of the study. The intensity of the retreat was likely critical for detecting these intervention effects, as this was the first study to show an increase in telomere length over such a short duration.

Meanwhile, interventions of shorter duration or lower intensity have not demonstrated changes telomere length (see Ref. [44], in this special issue).

Because retreats afford high doses of practice that are hard to preserve upon return to daily life, they allow researchers the chance to chart the durability of intervention effects well beyond the training context itself. In some cases, the cognitive changes that occur with intensive meditation might be retained with ongoing non-intensive practice outside retreat. For instance, in a seven-year follow-up [28*] to our three-month retreat study [35], we observed that accuracy improvements in sustained attention and response inhibition were maintained at post-intervention levels for up to several years later. Critically, these performance benefits were maintained better in those practitioners who had a dedicated regimen of daily practice (about one hour a day) in the years following retreat. However, not all of the attentional benefits of intensive training are expected to be as amenable to maintenance. Reductions in reaction time variability, which are thought to reflect improvements in attentional stability, have been observed in a few retreat studies [25,38]. Yet in our follow-up study, we demonstrated that these improvements quickly return to pre-intervention levels after retreat [28*], suggesting that some attentional capacities may be sensitive to high-intensity practice on retreat, but not to low-intensity practice in everyday life.

Retreats also hold utility for characterizing how training trajectories vary between individuals [45], and who might benefit most from mindfulness-based interventions [16]. For example, baseline personality variables and retreat practice engagement were found to moderate retreat-related changes in telomere length in our month-long retreat study [27*]. Individuals lower in agreeableness, and those higher in neuroticism, demonstrated the greatest increases in telomere length while on retreat. Additionally, people who reported practicing more diligently while on retreat showed greater increases in telomere length. These findings underscore the importance of considering individual differences when assessing intervention effects. In the future, researchers should investigate how other motivational factors, such as one's ethical framework or worldview [2**], serve to moderate training outcomes. It may also be valuable to use repeated retreat attendance as an explanatory variable, as recent studies indicate that lifetime retreat experience may be an important predictor of long-term training outcomes, including physiology (respiratory rate [46]), cell aging (telomerase activity [27*]), and affect-related brain activity (amygdala activation to emotional stimuli [47]).

An ambitious but critical avenue for future research is to assess how changes in attention and cognitive abilities on retreat might foster corresponding changes in

compassion and well-being. As support for these claims, we have reported that attentional changes during a focused-attention retreat are predictive of subsequent improvements in self-reported psychological functioning [35], and that retreat attendance is associated with altered emotional responses to the suffering of others [48]. Relatedly, investigators will need to explore more detailed accounts of what constitutes well-being, along with the different motivations, goals, and experiential changes that might arise from engaging in intensive meditation practice. One likely difference between intensive and non-intensive training is how impactful, durable, or transformative these effects are felt to manifest across life domains. Qualitative methods may ultimately provide the most meaningful answers to these sorts of questions [49,50*]. Finally, because retreats are such intensive interventions, it is important for researchers to be cognizant of both the positive and potentially adverse effects of this style of training [15**,51].

Conclusions

Mindfulness-based inductions, interventions, and mobile training applications have been widely adopted across diverse domains of psychological inquiry [15**,17**,52], and the results of these studies now garner considerable interest in the popular press [53]. This work has yielded key insights into the neurocognitive correlates and intervention efficacy of select mental training regimes. However, by relying on scalable, modular, and highly manualized training protocols, researchers have arguably been left with a limited understanding of the full range of effects of contemplative practice. A more balanced and integrated literature—which includes studies of different intervention durations, intensities, and levels of practitioner experience—is needed to better capture these effects and the developmental trajectories that support their expression.

Conflict of interest statement

Nothing declared.

Acknowledgements

This work was supported by an Affective Science Training Fellowship (NIH 5T32MH020006-20) to QAC, and Hershey Family Foundation and research gift funds from an anonymous donor to CDS. We thank Alea Skwara for comments on an early draft of the manuscript.

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