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ORIGINAL RESEARCH

Meditation Benefits and Drawbacks: Empirical Codebook and Implications for Teaching

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Abstract

Meditation has become a cultural phenomenon, and modern scientific research on the topic has exploded. Thousands of scientific articles report various benefits of meditation including clinical, physiological and well-being outcomes. Despite these benefits, drop-out rates in mindfulness-based interventions remain a problem and little work has studied the drawbacks of meditation. Reports of adverse reactions to meditation have emerged and critical voices have begun advocating caution, rather than enthusiasm, for meditation training. Furthermore, the experiences of meditators outside interventions and conventional lab studies are not well understood. Here we develop an empirical codebook of and framework for meditation benefits and drawbacks (MBDs), discussing the actionable implications for meditation training in the real world. These data reveal the major drawbacks hindering real-world meditators, including several less intuitive drawbacks. We also report the major benefits of meditation and generate a structural framework from which they can be understood in parallel with drawbacks. We investigate whether meditation styles affect MBDs and report comparisons between current and former meditators. These results bring cogent structure to the variety of meditation outcomes laypeople experience. As the number of meditators continues to increase, we need such structures to inform how meditation is taught, ensuring ethically informed consent and optimizing practice-fit. Mixed-methods research such as this study allows a greater practical understanding of how meditation is experienced in situ. This work complements the literature on the clinical benefits and neurophysiological mechanisms of meditation and this framework will inform clinicians, researchers and meditation teachers as best practices are reviewed in the coming years.

Keywords Meditation · Mindfulness · MBI · Negative outcomes · Attention training · Qualitative · Online · Open science

Introduction

Meditation has been called a non-pharmacological cognitive enhancement technique (Dresler et al. 2013) and a 2017 Special Issue of Journal of Cognitive Enhancement highlighted meditation research, theory and opinions (Crescentini et al. 2017). This issue touched upon topics including meditation's effects on athletic performance, sustained attention, working memory, age-related cognitive decline and default mode network activity. Participants were diverse, including studies with primary school children, college football players, sleep-restricted participants and a proof-of-concept study looking at a single participant. Different styles of meditation were discussed and investigated, including focused attention, open monitoring, mindfulness meditation and mantra-based practices.

While publications such as the 2017 Special Issue highlight the rapid expansion of research on mediation in recent decades, the diverse range of outcomes experienced by meditators is not well understood. Meditation is often described as unequivocally beneficial despite knowledge that meditation training can also be stressful, with drop-out rates in introductory meditation training programs approaching 30% (Crane and Williams 2010) and an unknown percentage of participants ceasing meditation following course completion. While it is increasingly recognized that meditation may not benefit everyone (Farias and Wikholm 2016; Farias et al. 2016), drawbacks to

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meditation have not been the subject of study until very recently with specialized populations (Lindahl et al. 2017). When research focuses solely on specialist samples and the assessment of known benefits, studies may be blind to unanticipated benefits and drawbacks experienced in the wider public, biasing the characterization of meditation in the research literature (Cebolla et al. 2017). Presently, there are no models predicting for whom meditation is likely to be beneficial or detrimental (Dobkin et al. 2012), a gap in the research literature that might be addressed by more open-ended analysis of meditation outcomes using wider community samples. Indeed, prominent researchers have advocated greater investigation of first-person perspectives on meditation practice (Davidson and Kaszniak 2015).

Qualitatively surveying current and former meditators may form the basis for a meditation benefits and drawback (MBD) model based on reported first-person perspectives. An empirically grounded MBD model could then inform current meditation training programs. For example, while many meditation training programs involve information sessions supporting enrollment, expected benefits and challenges are often anecdotal. The absence of an empirical database describing the relative frequency of benefits and challenges highlights a major gap in current research. Without empirically derived MBD descriptions, consent in meditation training programs is not properly informed, nor are fledgling teachers well-prepared for participants' typical experiences and potential barriers to realizing meditation benefits. An empirically based MBD model could help to provide realistic expectations for training.

The present work develops an initial, general MBD model well suited for modern Western meditators. While novel and thus necessarily limited, this first step could allow prospective practitioners to assess the tolerability of anticipated drawbacks of meditation in general relative to other pursuits. More advanced MBD models could focally compare particular MBD profiles across different styles of meditation, thereby linking people to the practices most associated with individually valued training outcomes. Critically, the choice of practice could be motivated not only by the pursuit of valued benefits but also by consideration of drawbacks associated with each style, allowing for better self-selection into appropriate practices and potentially improving training retention and long-term adherence.

The Benefits of Practice

Hundreds of scientific articles report various benefits of contemplative practice across numerous clinical domains, including conditions such as depression, anxiety, chronic pain and substance use disorder, as well as non-clinical indices of well-being including mood, emotion regulation and physiological health indicators such as blood pressure (Brown et al. 2007; Eberth and Sedlmeier 2012; Goyal et al. 2014; Grossman et al. 2004; Khoury et al. 2013; Mesmer-Magnus et al. 2017). The effects of meditation, however, have been largely operationalized through focal construct assessments rather than allowing for open-ended reporting of benefits and drawbacks. The apparent homogeneity of reported benefits may be a by-product of clinical research preceding qualitative and ethnographic reports, thereby unintentionally masking a wider diversity of outcomes. Furthermore, it seems unlikely that a single pattern of outcomes would be typical of all meditation styles as meditation styles themselves are varied, even before considering the heterogeneity of individual practitioner experiences (Goyal et al. 2014). It therefore remains unknown whether the measures typically employed in meditation studies include the diversity of outcomes non-expert meditators in real-world communities may experience.

The Drawbacks of Practice

While meditation interventions, particularly those framed as mindfulness interventions, have shown reasonable clinical efficacy, the significant dropout rates and lack of full adherence to prescribed practice regimens belie the notion that meditation training is universally pleasant and easily tolerated. Accordingly, research has more recently begun investigating adverse reactions to meditation practices (Dobkin et al. 2012; Lindahl et al. 2017; Shapiro 1992; Wong et al. 2018).

While reviews of negative outcomes of meditation are uncommon (Kuijpers et al. 2007; Ng 1999; West 1979), numerous case studies have accrued over the past four decades indicating consistently reported meditation drawbacks including anxiety, mania, traumatic memories, existential challenges, depersonalization and derealisation and dozens of reports of acute schizophrenic episodes or meditation-induced psychosis (Castillo 1990; Fenwick 1983; Lustyk et al. 2009). Lustyk et al. (2009) reviewed the published literature and defined three categories of negative outcome: mental health, physical health and spiritual health. They state, however, that their conclusions are limited in that they reviewed primarily case studies which often involved participants in intensive meditation retreats, not casual meditators. Cebolla et al. (2017) created a checklist of potential experiences based on Lustyk et al. (2009) and categorized participant responses of unwanted effects into eight pre-established categories: anxiety, pain, depersonalization/derealisation, hypomania/depression, emotional lability, visual focalization problems, loss of consciousness/dizziness and non-specific. Questionnaires that probe pre-established categories are extremely valuable in well-mapped subject areas, but the drawbacks of meditation may not be well categorized enough for such methods to capture all relevant phenomena. Indeed, there may be drawbacks that are not merely extensions of what has previously been reported in the intensive meditation case study literature.

In a novel empirical work, Lindahl et al. (2017) used qualitative interviews to identify a variety of distressing outcomes experienced by Buddhist meditators. These meditators reported a variety of cognitive, affective and social problems associated with their meditation experience; they also reported somatic and perceptual issues, as well as disruptions in their sense of self and self-motivated action ("conative" issues). While these issues were often severe and sometimes debilitating, the participants in this study may also not be representative of the average meditator: 34% were engaged in practice for 1–9 h daily and 41% were engaged in 10 or more hours per day when problems arose. While the intensity of participant devotion to practice may limit the generalizability of the findings, this research establishes that, at least at high practice doses, major drawbacks to meditation exist. These sobering findings support the merit of further study in a more representative sample of typical meditation practitioners drawn from the general population.

Methods

The Present Study

We explored the diversity of benefits and drawbacks experienced by current and former meditators in a cross-sectional, retrospective, online study. Participants reported the style and extent of their meditation practices, as well as subjective MBDs. To reduce the influence of experimenter bias in developing an MBD model, we used a grounded theory approach to identify commonly reported MBDs and explore their relationship to practice habits. Our objective was to deliver an initial empirical MBD taxonomy based on real-world meditators with tangible implications for meditation training meant for the Western public. We considered differences between session durations by exploring whether this salient descriptor of practice was associated with different MBD profiles. We also explored differences between current and former meditators on personality variables to evaluate whether certain types of people were more likely to cease meditation practice.

Grounded Theory Method

The coding authors (TA & MS) separately coded the reported sets of benefits and drawbacks using the principles of classic grounded theory to arrive at two independent codebooks (Corbin 2017; Corbin and Strauss 1990; Stol et al. 2016). These codebooks included three layers of abstraction: codes (level 1) were grouped into concepts (level 2), and concepts were further grouped into categories (level 3). The coding authors discussed initially discrepant coding strategies by determining useful degrees of abstraction versus specificity until code-saturation was reached by consensus and all relevant information was coded. The unified codebook was compiled via an iterative process of discussing and justifying each code, concept and category. The resulting empirical MBD codebook ("Benefits of Meditation" and "Drawbacks of Meditation") was then used to re-code the original dataset into a single set of codes, concepts and categories. As per grounded theory, this qualitative coding methodology intentionally incorporated the terminology and phrasing used by the participants to better reflect its data-driven nature.

Participant Recruitment Methods

Only self-identified current and former meditators were included in the study, with current meditation defined as at least one meditation session per month. Participation was solicited from the online forum "reddit" (Reddit Inc., San Francisco, CA, USA). Reddit is a social news aggregation website whereupon sub-groups, called "subreddits", curate content that caters to their collective interests. As such, Reddit is a source of self-organizing interest groups that willingly spend time discussing or reading about a shared topic of interest, which makes this set of communities an especially amenable, yet relatively untapped, resource for participant recruitment in line with modern crowdsourcing approaches (Peer et al. 2017). Approximately half of Reddit users log in from the USA and tend to be younger, more educated and disproportionately male (67%) compared to the general US population (Sattelberg 2018). This sample necessarily limits the generalizability of our findings to modern Western meditators. Lay practitioners from the following subreddits were solicited: Meditation, Mindful_Meditation, Mindfulness, Nondirective, Spirituality, Transcendental, Vipassana, Zen, Buddhism, ChristianMeditation, Hinduism, Jainism, SecularBuddhism, Sikh, FloatTank, LucidDreaming, Minimalism, Nootropics, Psychonaut and SampleSize (Anderson 2017). All research was conducted under informed consent in accord with the Declaration of Helsinki. Participated volunteered their responses without financial compensation.

The final sample size was 240 participants. Of 717 total respondents, 250 participants completed the core survey modules (most respondents exited before the second page). Of these 250 participants, 2 requested their responses be withdrawn, 2 mistakenly reported both no longer meditating and still meditating and 6 reported practices that are not meditation (e.g. "self hypnosis", "music"): these 10 participants were removed from analysis.

Design and Questionnaires

Participants completed a battery of questionnaires using an online web-portal served by the Qualtrics survey engine (Qualtrics, Provo, UT, USA). The complete questionnaire is available on the Open Science Framework (Anderson et al.

2016) and includes a number of both closed- and open-ended questions about experiences and consequences of meditation. Here we report on questions pertaining to the participant's history with meditation, meditation style, perceived benefits and drawbacks of meditation and personality variables.

History of Meditation

Questions primarily concerned the meditation with which the participant reported having the most experience. Quantitative questions included session duration, practice frequency and years of practice. Qualitative questions asked whether participants had ever experienced something particularly good or profound during or as a direct result of meditation and likewise whether participants had ever experienced something particularly bad or frightening during or as a direct result of meditation.

Meditation Benefits and Drawbacks

We asked participants to report up to three benefits and three drawbacks of meditation, rating how important each benefit and drawback was to them on a sliding scale from 0 to 100. Our most basic hypothesis was that a variety of benefits and drawbacks would exist and be amenable to open-coding. While other questions in the survey were open-ended, the response boxes for benefits and drawbacks were smaller to encourage participants to use only a few words or a brief phrase for each benefit and drawback.

Motivation and Achievement Styles

Single items assessed behavioural inhibition/activation and achievement orientation. One item was included from each subscale of the BIS/BAS (BIS, BAS Reward Responsiveness, BAS Drive, BAS Fun Seeking, Carver and White 1994) and each subscale of the Achievement Goals scale (Mastery, Performance Approach, Performance Avoidance, Elliot and Church 1997). All items were rated using a 0–100 sliding scale with nominal descriptors at 0 ("Does not describe me at all") and 100 ("Describes me well") (Matejka et al. 2016).

Personality

The Ten Item Personality Inventory (TIPI; Gosling et al. 2003) measures personality using the commonly recognized five-factor model: Extraversion, Agreeableness, Conscientiousness, Neuroticism and Openness. All items were rated using the aforementioned 0–100 scale. Spirituality and Religiosity were measured as single items on 0–100 sliding scales.

Mood

Participants completed a visual mood-board by clicking on mood-words organized into quadrants of valence and arousal (Anderson et al. 2016). Valence was calculated as the count of pleasant minus unpleasant items, and Arousal was calculated as high-intensity minus low-intensity items.

Analysis and Results

Sample Statistics and Meditation Styles

Our online recruitment strategy resulted in a sample of modern Western meditators. Participants were primarily from the USA (50%), Canada (17%) and the UK (4%) and were majority white (67%). Many participants reported being non-religious (56%) while others reported Buddhist (12%), Christian (8%) and various other religious affiliations (24%) including a variety of syncretic or spiritual-but-not-religious affiliations. Socioeconomic status (NRS 2018) of the household in which participants lived at the time they learnt to meditate was primarily upper-middle class (14%), middle class (38%) and lower-middle class (21%). Most participants identified as heterosexual (81%).

Of the 240 included participants, 211 (88%) reported continued meditation practice at least once per month while 29 (12%) had stopped meditating. One hundred and ninety-one participants provided demographic information (173 current meditators: 72% male, 25% female, 3% other, mean age 30.3 (SD 11.0); 18 former meditators: 72% male, 22% female, 6% other, mean age 31.3 (SD 13.2)). Current meditators had 4.78 (SD 7.25) years of practice (range < 1–48) and former meditators had 1.78 (SD 1.91) years of practice (range < 1–8). When asked about good and bad experiences, 160 (76%) meditators indicated that something particularly good or profound had happened during or as a direct result of meditation (range by meditation style 50–84%) while 43 (20%) indicated some particularly bad or frightening experience (range by meditation style 0–30%).

Participants entered the name of the meditation with which they had the most experience and these names were coded according to emergent groupings (see Table 1): Mindfulness, Vipassana and Zazen are popular groupings that reflect well-known meditation techniques or styles; Other Breath-Based Practice captures any remaining meditation clearly involving breath-attention (e.g. "Headspace", "Focus on breathing", "Counting breath", "Breathing meditation"); Other Established Practice captures any remaining less-represented meditation style from any established traditional systems (e.g.

Table 1 Meditation styles

Meditation style	Number	Current | Former	Session duration*	Male | Female | Other	Age mean (SD) median
Mindfulness	71	61 | 10	20	41 | 18 | 0	26.83 (6.74) 26.17
Vipassana	37	34 | 3	30	22 | 4 | 2	31.27 (9.47) 29.42
Zazen	18	17 | 1	22.5	10 | 3 | 0	30.86 (15.08) 23.92
Other Breath-Based Practice	37	30 | 3	15	20 | 3 | 1	29.38 (11.46) 26.42
Other Established Practice	31	25 | 2	20	14 | 7 | 2	36.45 (14.06) 33.75
Idiosyncratic Practice	46	38 | 7	20	27 | 8 | 2	31.62 (12.73) 27.67
Total	240	211 | 29	20	137 | 47 | 7	30.37 (11.22) 27.50

Note: Not all participants supplied demographic information thus total row values differ

*Session duration median (min) is reported to eliminate effects of extreme values

Transcendental Meditation, Metta, Shamata, Naam Simran). Finally, the "Idiosyncratic Practice" grouping captures any remaining descriptions that did not fit any other category, including a number of uniquely devised meditation styles (e.g. "my own 'mixed style' meditation", "Self learned", "Personal meditation") or other styles of unknown source (e.g. "Thought dissolving", "youtube meditation").

As age data was non-normally distributed a post hoc Kruskal–Wallis test was run, showing a significant difference in Age across meditation styles ($H(5) = 11.765$, $p = .038$, $\varepsilon^2 = 0.05$) and follow-up Bonferroni-corrected pairwise Wilcox tests revealed one significant difference: Mindfulness practitioners were significantly younger than practitioners of Other Established Practices ($p_{adj} = 0.026$). There were no significant differences in $p = r =$ the male/female ratio ($\chi^2(5) = 3.27$, $p = .658$) across different style nor any significant difference in the ratio of current to former meditators in different styles ($\chi^2(5) = 3.27$, $p = .658$, $r = 0.13$).

Benefits of Meditation

Grounded theory coding and memoing resulted in a total of 1028 coded benefits of meditation. Taxonomy building resulted in 40 codes organised into 14 higher-order concepts and 8 highest-order categories (Figure 1). The most frequently reported low-level codes were Calm (12.9%), Focus (9.0%), Peace (5.7%) and Emotional Management (5.0%). At the higher-order concept level, the most frequently reported benefits were Calm Emotions (18.7%), Enhanced Attention (16.7%) and Insight and Personal Growth (11.7%).

Categories of Benefit

This summary will provide extended descriptions of the eight categories of benefit that were distilled from participant reports. As per grounded theory, the naming conventions of the codes followed the language used by participants, but at higher orders of abstraction, more flexibility was needed to account for the relations between the concepts and codes. A complete description of every code is available in the codebook (Anderson et al. 2016). Here we focus on Categories and the relations between Concepts contained therein. Three clusters of frequency emerged: Very Common (20–50%) categories included emotional benefits and cognitive benefits; Common (10–20%) categories included growth, resilience and health management; and Occasional (< 10%) categories included mindfulness, social and interpersonal benefits and other important benefits.

Emotional Benefits The Emotional Benefits category was the most frequently reported benefit–category (24.4%) and captured all codes related to both Calm Emotions and Positive Emotions. Calm Emotions was the most frequently reported benefit–concept (18.7%) and contains two of the three most reported level 1 codes, which reference calm, peace, relaxation and equanimity gained from meditation. Positive Emotions references reports of happiness, joy, bliss, freedom, fun and any other positive enjoyment-related states.

Cognitive Benefits The second most frequently reported benefit category (23.2%), Cognitive Benefits, included the following concepts: Enhanced Attention, Self-Control and Cognitive Enhancement. Enhanced Attention was the second most common benefit–concept and references all reports related to superior attention, such as increased awareness, clarity of mind and thought and focussed concentration. Self-Control references increased self-control and patience or decreased reactivity. Cognitive Enhancement refers to feeling more intelligent and reporting enhanced experiences of decision-making, memory and creativity.

Growth Growth incorporated two types of growth: Insight and Personal Growth and Existential and Spiritual Growth. Insight and Personal Growth were the third most commonly reported benefit–concept (11.7%) and references self-knowledge, such as self-awareness and introspection, learning about oneself, open-mindedness, increased perspective, understanding, insight and wisdom, as well as self-improvement, confidence and expressiveness. Existential and Spiritual Growth refers to other types of growth: decreased existential anxiety and lack, increased spiritual strength and insight and feelings of religious connection.

Health Management Health Management refers to the management of both mental and physical health. Mental Health Management references decreases in anxiety and increased ability to cope with anxiety, as well as broader feelings of enhanced mental health and well-being. Physical Health Management references improved physiological health, overall or in specific domains (e.g. blood pressure, pain, sleep).

Resilience Resilience refers to one's capacity to adapt and recover in the face of adversity, i.e. the management of emotions and stress. Emotional Management references the awareness of emotions as they arise and the ability to handle these emotions, which precipitates emotional stability. Stress Management references stress relief and the refreshing psychological restoration that meditation can impart.

Mindfulness This category stands out as it is one of two categories of benefits that is also a level 2 concept. Mindfulness was conceived as a collection of common definitional components present in the literature. Mindfulness here refers to acceptance and non-judgement, decentering and detachment from thoughts, present moment awareness and reports of Mindfulness per se.

Social and Interpersonal Benefits Social and Interpersonal Benefits is the other category of benefits that is also a concept: Prosocial Emotions. These benefits reference kindness, compassion, empathy, connection and a sense of community.

Other Important Benefits This category was a catch-all for otherwise uncategorized codes incorporating various contents (e.g. personal time, enhanced dreams, strength, hope).

Drawbacks of Meditation

Grounded theory coding resulted in a total of 642 coded drawbacks of meditation. Taxonomy building resulted in 23 codes organised into 9 higher-order concepts and 7 highest-order categories (Figure 1). The most frequently reported low-level codes were Time Consuming (26.3%), Physical Discomfort (7.2%) and Difficulty (5.6%). At the higher-order concept level, the most frequently reported drawbacks were Time Demands (29.4%), Affective Demands (12.6%) and Stigma and Disconnection (11.1%).

Categories of Drawbacks

As above, this summary will provide extended descriptions of the seven categories of drawback and grounded theory convention was followed, i.e. naming conventions of the codes followed the language used by participants with flexibility introduced at higher levels of abstraction. A complete description of every code is available in the codebook (Anderson et al. 2016). Three clusters of frequency again emerged: Very Common (20–50%) categories included time demands and learning curve, Common (10–20%) categories included negative emotional and psychological outcomes and social and interpersonal drawbacks, and Occasional (< 10%) categories included stressful personal change, negative health outcomes and serious adverse events (2.3%).

Time Demands Time Demands was the most frequently reported category in the survey (29.4%) and included the single most frequently reported code: Time Consuming (26.3%). Time Demands references meditation as time-consuming and time spent on meditation that could have been spent elsewhere.

Learning Curve Learning Curve was the second most commonly reported drawback-category (22.7%) and references the Affective Demands and Task Demands of meditation. Affective Demands references commonly reported (12.6%) difficulty, effort and frustration experienced in and because of meditation, especially in beginners. Task Demands references the difficulty forming and maintaining habits related to meditation, slow progress and lack of immediate results and certain environmental demands, such as finding a quiet space suitable for meditation, especially when travelling.

Negative Emotional and Psychological Outcomes This category consists of various psycho-emotional problems including Psychological Adversity and Negative Emotional Outcomes. Psychological Adversity included a catch-all code for psychologically adverse content not otherwise captured (e.g. troubling or scary thoughts and experiences, sadness and depression, bad memories), a code for aversive over-awareness (e.g. over-awareness of sensations, emotions, thoughts and social

Table 2 Level 2 (concept) benefits and drawbacks by session duration

Duration	Shorter	10 min	15 min	20 min	30 min	Longer
Three most common benefits (level 2)	Enhanced attention (Various tied)	Calm emotions	Calm emotions	Enhanced attention	Calm emotions	Calm emotions
		Enhanced attention	Insight and personal growth	Calm emotions	Enhanced attention	Enhanced attention
	(Various tied)	Insight and personal growth	Enhanced attention	Insight and personal growth	Insight and personal growth	Emotional management
Benefit Mean (SD) median	69.81 (34.53) 85	85.83 (20.52) 100	82.64 (21.11) 90	86.21 (23.69) 99	86.30 (19.07) 96	83.92 (24.55) 100
Three most common drawbacks (level 2)	Time demands	Time demands	Stigma and disconnection (tie)	Time demands	Time demands	Time demands
	Psychological adversity	Existential and personal change	Affective demands (tie)	Affective demands	Stigma and disconnection	Affective demands
	(Various tied)	Task demands	Time demands	Psychological adversity	Task demands	(Various tied)
Drawback Mean (SD) median	27.86 (28.75) 16.5	32.66 (30.66) 25	40.19 (30.47) 35	36.26 (33.49) 22	31.36 (28.73) 24	41.85 (31.61) 43

*Session duration (bins): shorter (< 10 min), 10 min (10–15 min), 15 min (15-20 min), 20 min (20–25 min), 30 min (25-30 min), longer (> 30 min). Means are participant ratings of the self-attributed importance/impact of MBDs (0–100 scale)

experiences) and a code for discomfort not otherwise specified. Negative Emotional Outcomes captured negatively valenced emotional states, such as boredom, anxiety, nervousness, doubt and fear of failure in meditation.

Social and Interpersonal Drawbacks This category contains the concept of Stigma and Disconnection, which was the third most frequently reported drawback concept (11.1%). Stigma and Disconnection references perceived social stigma against meditators, feeling judged and misunderstood by others, inability to share experiences with non-meditators and feeling disconnection from people who do not meditate. Also included was a broader feeling of isolation and alienation.

Stressful Personal Change Stressful Personal Change encompasses existential and personal change. Existential and Personal Change references changes in personality, world view and personal life circumstances that the participant appraised as negative and stressful as well as decreased ambition and materialism, existential realisations and existential dread.

Negative Health Outcomes Negative Health Outcomes mirrors the level 2 concept of the same name. This category/concept references physical discomfort, such as pain or discomfort in the legs or back, and sleep disturbances, such as insomnia and drowsiness.

Serious Adverse Events Serious Adverse Events were the least frequently reported category (2.3%). Serious Adverse Events references major functional disruptions such as suicidal thoughts, hallucinations, or psychosis. While Negative Health Outcomes reflect temporary discomfort, Serious Adverse Events were reserved for intensely debilitating conditions which could result in loss of function and may require medical intervention to resolve.

Benefits and Drawbacks by Duration of Meditation Session

Prominent meditation benefits and drawbacks are here reported as a function of practice duration (Table 2). As importance ratings were non-normally distributed, an Wilcoxon signed rank test was computed, finding a significant difference between the rated importance of benefits versus drawbacks ($W(5) = 24.04$, $p < .001$, $\varepsilon^2 = 0.10$) with benefits (median = 89.33, SD = 19.78) rated as significantly more important than drawbacks (median = 32.92, SD = 27.11). Ratings of benefit and drawback importance did not statistically differ across session durations (benefits: $H(6) = 6.15$, $p = .41$, $\varepsilon^2 = 0.026$; drawbacks: $H(6) = 4.72$, $p = .58$, $\varepsilon^2 = 0.020$) or meditation styles (benefits: $H(5) = 2.14$, $p = .83$, $\varepsilon^2 = 0.009$; drawbacks: $H(5) = 6.31$, $p = .28$, $\varepsilon^2 = 0.03$). There were, however, significant differences in session duration across styles ($H(5) = 24.04$, $p < .001$, $\varepsilon^2 = 0.10$; see Table 1) with follow-up Wilcox tests revealing Vipassana had longer median session

durations than Mindfulness ($p_{adj} < 0.001$) and Other Breath-Based Practices ($p_{adj} = 0.007$). While many of the most popular meditation traditions, such as Vipassana and Mindfulness, recommend session durations of 40 min or more, the modal duration in our sample was 20 min per session. Common benefits are nearly identical across duration classes and Time Demands is a consistently reported drawback. Some variability can be seen in the particular drawbacks associated with each session duration with affective demands and social stigma more commonly endorsed when meditating for 15 min or more.

Personality and Meditation Persistence

Effect sizes evaluating differences in benefit and drawback importance, motivation and achievement styles, personality and mood are displayed in Table 3. These exploratory measures show four significant differences: current meditators rated benefits as more important than former meditators, had higher mood-valence (i.e. more positive mood) than former meditators and had higher openness and spirituality than former meditators. Trends toward difference were also found such that current meditators had higher extraversion and agreeableness and lower neuroticism than former meditators. These findings are in line with the broad literature on the beneficial effects of meditation, and further empirical studies are required to tease apart how individual differences affect adherence.

Discussion

We have found evidence for diverse MBDs that differ greatly in their prevalence. These findings hold important theoretical and practical implications for meditation instruction.

Implications for Teaching: Informed Consent for New Meditators

One of the most important findings of this study is the verification that meditation carries not only predictable and ubiquitous drawbacks, most notably the time commitment required, but also a risk for more substantive harm. Approximately 20% of practitioners reported having experienced something particularly bad or frightening during or as a direct result of meditation. Disturbing and highly uncomfortable drawbacks were coded, including psychological adversity (e.g. fear, sadness, worry) and negative health outcomes (e.g. pain, insomnia). Stressful personal changes (e.g. existential dread, changing worldviews, alienation from social norms) were also reported, and feeling that meditation resulted in stigmatization, disconnection and isolation was common. These drawbacks are not the prescribed purpose or proposed effective mechanism through which meditation brings about its benefits. According to the WHO, an "unexpected adverse reaction" is "an adverse reaction, the nature or severity of which is not consistent with domestic labelling or market authorisation, or expected from characteristics of the drug" (Couper 2002). While meditation is not a drug per se, it is both a prescribed treatment and its teaching is a saleable service: as a matter of ethics new meditators should be properly informed anywhere meditation is taught. Informing new meditators about these potential drawbacks would be an important disclaimer for meditation courses and mobile apps. This informed consent may better prepare practitioners for some of the struggles they are likely to experience. In this, our data accords with a growing number of voices advocating caution, rather than unbounded enthusiasm, when recommending meditation training (Cebolla et al. 2017; Compson 2018; Farias and Wikholm 2016; Farias et al. 2016; Josipovic and Baars 2015; Lindahl et al. 2017; Lustyk et al. 2009; Van Dam et al. 2018).

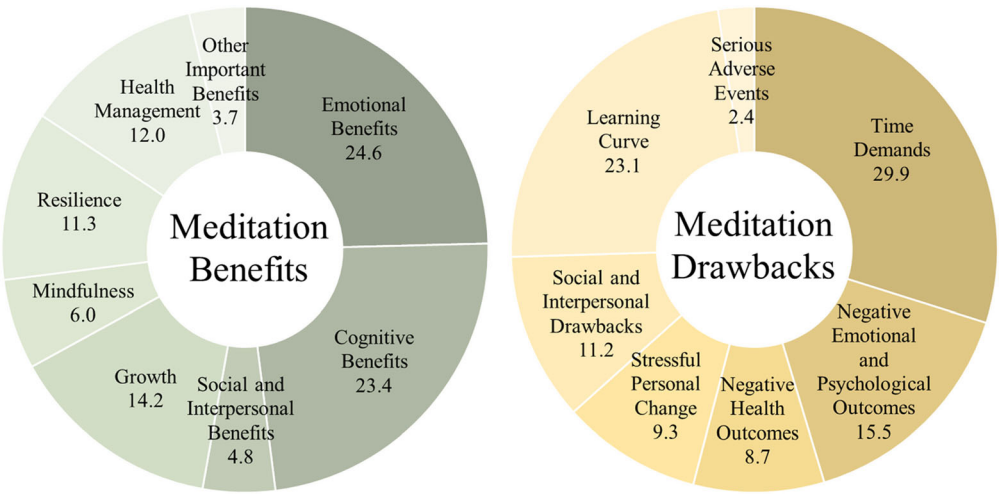

Fig. 1 Meditation benefits and drawbacks

Table 3 Personality of meditators

Personality Variable	Current meditator	Former meditator	Effect sized [95% CI]
Benefit importance	86.26 (16.88)	60.82 (28.55)	**1.39 [0.88, 1.9]**
Drawback importance	35.64 (26.60)	45.41 (30.41)	− 0.36 [− 0.87, 0.15]
Mood—Valence	2.48 (4.80)	0.21 (5.06)	**0.47 [0.08, 0.86]**
Mood—Arousal	− 0.21 (2.91)	− 0.83 (2.47)	0.22 [− 0.17, 0.61]
Extraversion	39.92 (23.61)	30.00 (22.93)	*0.42 [− 0.06, 0.90]*
Agreeableness	64.04 (18.91)	56.29 (21.12)	*0.41 [− 0.07, 0.88]*
Conscientiousness	64.20 (21.95)	62.29 (27.04)	0.09 [− 0.39, 0.56]
Neuroticism	37.10 (23.73)	47.74 (29.52)	*− 0.44 [− 0.92, 0.04]*
Openness	76.77 (16.49)	64.16 (24.19)	**0.73 [0.24, 1.21]**
Spirituality	57.76 (31.86)	34.89 (35.49)	**0.71 [0.22, 1.20]**
Religiosity	18.52 (26.94)	16.61 (25.88)	0.07 [− 0.42, 0.56]
Behavioural inhibition	54.75 (30.95)	57.58 (29.73)	− 0.09 [− 0.57, 0.39]
Behavioural activation reward	59.31 (27.93)	63.47 (32.92)	− 0.15 [− 0.62, 0.33]
Behavioural activation drive	57.95 (28.63)	51.68 (26.87)	0.22 [− 0.26, 0.70]
Behavioural activation fun	61.49 (30.50)	72.74 (25.33)	− 0.37 [− 0.85, 0.10]
Mastery orientation	86.74 (20.20)	79.89 (23.73)	0.33 [− 0.15, 0.81]
Performance approach orientation	45.16 (32.19)	53.39 (37.94)	− 0.25 [− 0.74, 0.24]
Performance avoidance orientation	43.34 (33.57)	48.21 (33.24)	− 0.14 [− 0.62, 0.33]

Bold values indicate statistically significant effects ($p < 0.5$)

Italic values indicate 'trends' ($p < 0.10$)

Rather than reducing enrollment, informed consent is meant to provide prospective practitioners with realistic preparatory consideration when beginning meditation training. Informing new meditators about the potential for discomfort during meditation may improve program adherence by preparing participants and thus reducing dropouts related to unexpected negative experiences. By emphasising that meditation is a unique journey for every practitioner—and that this journey can sometimes prove difficult or painful—new meditators can prepare themselves and their loved ones for the challenges ahead, mustering resources to face them rather than discontinue practising. Indeed, it may be prudent to extend follow-up contact to probe new meditators for potential problems and offer support where appropriate (Anderson and Farb 2018).

Implications for Teaching: Time Commitment Needed for Practice

Informed consent may beneficially dissuade those not in a position to take on meditation-related Time Demands. Time Demands are the most common concern by a considerable margin and when a prospective student does not consent to setting aside the minimally required time for a proposed meditation style then alternatives should be considered. Experimental designs are needed to make causal claims about the dose–response relationship between meditation time and associated benefits as the present findings found no differences in the importance of benefits reported for different session lengths or meditation types. Our results indicate that 20 min is the modal amount of time committed to daily meditation practice and may be sufficient for many of the benefits of meditation to accumulate. Dismantling studies focusing on optimizing session length and measuring potentially differing MBD patterns could address concerns around Time Demands, the most common meditation drawback. These results are in line with those of Cebolla et al. (2017) who suggest that unwanted effects are more prevalent in those practicing longer meditation sessions, also pointing to the need for prospective studies. The idea that 20 min meditations may be sufficient to reap the most common benefits of meditation is especially pertinent given that some of the most popular meditation training programs prescribe much longer session durations (e.g. Mindfulness Based Interventions prescribing daily 40–60 min sessions, Vipassana prescribing 60 min sessions twice-daily, cf. Transcendental Meditation prescribing 20 min sessions twice-daily).

It may be the case that particular desired benefits—such as the radical transformation of identity—require greater time commitment. Such benefits were not commonly endorsed in our sample of meditators, however, and there were no differences in commonly reported benefits across session durations. Therefore, without research supporting the incremental benefit of longer sessions, we cannot recommend sessions longer than the modal session duration of 20 min, especially in light of the high endorsement of Time Demands as a drawback. Similarly, no meditation style offered significantly more important benefits than any other, though it could be that practice-specific optimal session durations exist, which offers another possible avenue for future dismantling research.

Implications for Teaching: Parallelism and Reframing

The taxonomy of concepts elicited by our grounded theory analysis reveals several parallels between benefits and drawbacks (see Table 4). Similarities indicate that some meditation-related outcomes can be viewed through a positive or negative lens, which provides clues to how common drawbacks could be reframed as potential benefits.

An example of reframing may be applied in managing Stressful Personal Change by weighing reduced stability of self-concept and worldview against the benefit–category of Growth. Rather than focusing on the loss of a particular way of relating to the self and the world, meditators may explore how such stressful changes may ultimately lead to personal development. Meditators struggling with such changes may benefit from a reminder that personal growth can be difficult yet rewarding, but that they should seek help in processing their difficulties as they arise. The present findings may help to normalize these commonly cited drawbacks as a regular experience on the road towards self-improvement. Future research may help better distinguish nominal feelings of distress and uncertainty in renegotiating self and worldview from the symptoms associated with pathological dissociative states that are unlikely to spontaneously remit (Lindahl et al. 2017; Van Dam et al. 2018). Experiencing an evolving worldview may be unavoidably stressful due to the dissolution of habitual patterns of thought and behaviour; articulating this trade-off may prepare meditators for the unexpected challenge of renegotiating personal beliefs.

A second major parallel exists between Social and Interpersonal Drawbacks versus Benefits, i.e. feelings of Stigma and Disconnection from others, especially non-meditators, as contrasted against greater Prosocial Emotions. While an unfulfilled desire for connection can be distressing, the desire to express and encounter greater levels of Prosocial Emotion can be life-enhancing. In our sample, 11% of codes concerned feeling more stigmatized, disconnected and isolated whereas only 4.8% of codes indicated more Prosocial Emotions (compassion/empathy, connection/community, kindness). Fostering a greater sense of understanding and community may help meditators reconnect. Indeed, one is reminded that the third "refuge" of Buddhism is the "Sangha", i.e. monastic community and/or community of committed Buddhists (Tanaka 2007). Teachers should inform new meditators about potential feelings of stigma, disconnection and isolation to ensure these risks are acceptable. It may be prudent for teachers to provide new meditators with local and online resources that connect them to other meditators and meditation communities; as half of our sample reported being non-religious, this is especially true for secular meditators. Such group memberships, when combined with beneficial prosocial emotions, are likely to promote helping behaviours that foster positive change in the social community beyond the individual meditators (Stürmer et al. 2005).

Our analysis also reveals several unparalleled MBDs (see Table 5) indicating meditation-related outcomes that could receive special attention, addressing concerns around unavoidable drawbacks and highlighting aspects of meditation that seem unequivocally beneficial.

For example, to address the most common drawback of meditation—Time Demands—teachers of meditation may explicitly discuss flexibility in how such demands are appraised. The teacher may normalize time-related concerns by acknowledging the challenge of finding time to meditate, a topic that is already commonly broached in meditation courses. Meditators could be taught to plan ahead with their schedule in mind, blocking off time in advance for practice. A teacher could present the time investment as an opportunity to cultivate autonomy and competence, thereby achieving high-frequency benefits, consistent with the tenets of self-determination theory in motivating behaviour change (Ryan and Deci 2000). Analogously, physical exercise interventions prioritizing "why" a person should make time for exercise are theorized to be more effective than those that do not (Fortier et al. 2007).

Furthermore, simply acknowledging that meditating has a Learning Curve with associated Task Demands would make a new meditator aware of certain requirements. Having beginners write down where and when they plan to meditate could further solidify the commitment to make space and time for practice and directly address the drawbacks of habit formation/maintenance and environmental demands (i.e. that the meditator find a place to sit down undisturbed for a set amount of time and that a quiet space is often preferred). Such demands are not amenable to cognitive reappraisal, but require planning to resolve, and as such should be an early topic in meditation training to build the foundation for good practice habits.

Meditation takes time to learn, time to practice and, depending on the style, time to master. The learning curve of many meditation styles can frustrate practitioners, especially when calm is elusive and mind-wandering during meditation is not. Mind-wandering is a ubiquitous characteristic of human mental life (Smallwood and Schooler 2006), and mind-wandering during meditation may contribute to feelings of effort, difficulty and frustration, which meditators indicate as the Affective Demands drawback. Accordingly, meditation training may benefit from taking time to reframe the experience of repeated exposure to mind-wandering. Trainees may be taught that mind-wandering is inevitable, instead focussing instruction on noticing when the mind has wandered. Indeed, every beginner will eventually fail to prevent mind-wandering, but every beginner will eventually succeed at noticing that the mind has wandered; in this way, what was once a frustrating failure can be celebrated as a success. Such discussion is already part of the curriculum of well-validated mindfulness interventions (Kabat-Zinn 2013, p. 392), but it is unclear to what extent novel forms of meditation training (e.g. app-based training) provide a similar interpretive framework for mind-wandering and other inevitable failures of attention.

Table 4 Parallel benefits and drawbacks

Benefit category	Drawback category
Emotional benefits	Negative emotional and psychological outcomes
Growth	Stressful personal change
Health management	Negative health outcomes
Social and interpersonal benefits	Social and interpersonal drawbacks

These unparalleled drawbacks may be necessary costs associated with the benefits of meditation, however, a number of benefits–categories have no obvious counterpoint. Cognitive Benefits was the second most commonly reported category of benefit, and it had no clear counter. Meditators report enhanced concentration, clarity, self-control and decision-making, and there is no parallel drawback (e.g. distractibility, confusion, "brain fog"). This is in keeping with the experimental research literature supporting attentional benefits of meditation (Jha et al. 2007; Mrazek et al. 2013; Tang et al. 2007; Zeidan et al. 2010; cf. Jensen et al. 2012). The cultivation of focus, self-control and cognitive capacity may be ideal foci for meditation research blending first- and third-person perspectives as Cognitive Benefits were frequently subjectively endorsed and have readily measurable qualitative markers.

While Serious Adverse Events are, by definition, the most impactful drawbacks, they were also the least commonly reported. Regardless of this low prevalence, a warning should be given to new meditators that if they feel any destabilization in their mood, sense of self or relationship with regular reality that this could be due to meditation and they should cease practicing and seek help in processing these difficulties. Meditation teachers should be made aware of these possibilities and should have referral material available to send anyone who may be affected to seek psychological help from licenced professionals with meditation experience. Further epidemiological research is needed to better characterize risk factors and the risks of Serious Adverse Events in meditation communities relative to the general population. Until this time, responsible meditation training should involve at least some discussion of these low-prevalence high-impact outcomes.

Table 5 Non-parallel benefits and drawbacks

Benefit category	Drawback category
Cognitive benefits	–
Resilience	–
Mindfulness	–
Other important benefits	–
–	Time demands
–	Learning curve
–	Serious adverse events

Limitations and Future Directions

The current study is inherently limited in its utility for establishing causal relationships, and we must emphasize the descriptive rather than causal implications of the current research. Furthermore, the sample itself may not be a representative description of the general meditation population, as a sample of Reddit users who possess the time to voluntarily participate in our survey limits our ability to characterize the experiences of all meditators around the world. The sample does however represent a wide cross section of real meditators, primarily from developed Western nations in the Anglo cultural cluster (> 75%). The participants are predominantly middle-class, white, male and heterosexual with average age around 30 years, and thus, these results cannot generalize to every meditator. As such, it would be premature to expect the present taxonomy prevalence values to fit any other specific population. Indeed, the present work was not intended to be exhaustive; this taxonomy represents the first large exploration into meditation outcomes in a sample of non-expert Western meditators. The meditators represented in the current study inform us on this surprisingly understudied population of ordinary meditators and future directions should consider investigating the experiences of more specific sub-populations in order to better tailor meditation training to the needs of those communities.

Including diverse meditation styles limits the possible specificity of the MBD taxonomy and limits our ability to comment decisively on MBIs. Given the paucity of MBD research, it seemed premature to focus on specific practice traditions or named interventions, but establishing relationships between specific MBDs and specific traditions or MBIs seems a promising avenue for future research. The relatively high prevalence of "Idiosyncratic Practice" as a meditation grouping is also a surprising and novel development: many participants who self-identified as meditators reported practices that were not easily categorized into established traditions, stemming instead from some combination of syncretism, individual imagination and non-sectarian internet sources. In this way, meditation has become a cultural phenomenon and the diversity of activities labelled as meditation reinforces the importance of clearly identifying traditions and the boundaries of accepted practices in both research and teaching. Such identification is perhaps most pressing when meditation training occurs in clinical contexts: in such situations, it should be

made clear that the meditations taught are specific to the program in which they are taught, not to be replaced by syncretic or personalized versions without recognizing that such alterations may introduce unexpected consequences that are not reflected in the research literature used to validate the clinical program.

The present study was designed without a longitudinal component, which precludes an understanding of how MBD patterns change over time within practitioners. It is difficult to estimate the stability of any MBD and many questions remain (e.g. Do concerns of time demands and learning curve diminish as practitioners develop supportive practice habits? Do feelings of stigma, disconnection and isolation increase as meditation becomes more incorporated into daily life?). Such questions should become the target of future research investigating the relations between practice habits, adherence and MBDs. While this study aimed to investigate differences between current and former meditators, the sample size of former meditators was quite low ($N = 29$) compared to the current meditators ($N = 211$). The population of former meditators, i.e. people who learn to meditate and later cease regular practice, are of great interest. To address the lack of understanding of this population, we intend to study a population of meditators longitudinally (Farb et al. 2018) by maintaining follow-up emails indefinitely, as described by Anderson and Farb (2018). Such a very long-term study will provide real-world adherence data and provide an opportunity to actively measure the MBDs described in the present article. We are currently employing a scale with items inspired by the MBD taxonomy for assessing meditation progress as a weekly questionnaire, longitudinally measuring ongoing practice, which will be published following validation (Farb et al. 2018).

Finally, while the study employed two raters, the joint development of a codebook and iterative reviews of coding practices, all qualitative research is inherently subject to biases in the decisions made by the research team. The integrity of these decisions was supported by eschewing hypothesis-driven coding and limiting exposure to the extant literature (Stol et al. 2016), but the potential that a different taxonomy could emerge if the analysis were repeated using different investigators nonetheless exists and will only be resolved if other researchers undertake complementary research projects. To facilitate transparency and re-analysis our data, both coded and raw data, are available on the OSF (Anderson et al. 2016).

Conclusion

Meditation has become a cultural phenomenon in the West and modern scientific research on the topic has flourished. Despite this, the benefits and drawbacks experienced by real-world meditators outside interventions and lab studies are not well understood. This study helps to identify an initial set of benefits and drawbacks in the hope that future research may relate particular benefits and drawbacks to particular practice styles, practice goals and personality types. In this paper, we reported meditation benefits and drawbacks—making our full codebook openly available to others—and use these insights to make actionable suggestions for meditation training paradigms, including the need for informed consent and proper warnings about the common drawbacks of practice. We suggest changes to the framing of anticipated drawbacks that may parallel potential benefits and have created a preliminary measure, inspired by the MBD taxonomy, to begin investigating the longitudinal effects of practice in an ordinary community sample. A large swath of the population now self-identifies as having a meditation practice. It is our hope that this qualitative research will help characterize the personal experience of contemporary meditators, complementing the literature on the clinical benefits and putative neurophysiological and cognitive mechanisms of meditation.

Compliance with Ethical Standards All research was conducted under informed consent in accord with the Declaration of Helsinki. Participated volunteered their responses without financial compensation.

Conflict of Interest The authors declare that there is no conflict of interest.

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