

BUDDHIST MEDITATION AND WESTERN SCIENCE: PROGRESS TOWARDS MUTUAL UNDERSTANDING

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ABSTRACT

What we now call Buddhist meditation grew up as a body of techniques and practices to assist in cultivating the central Buddhist goal of liberation from suffering. Over the succeeding centuries, many meditation techniques were developed in particular regions and traditions. While retaining their central orientation towards liberation and Buddhahood, today's Buddhist traditions have developed a great variety and richness of different approaches to assist in following the Buddhist path. The recent adoption of modified and secularized versions of Buddhist techniques within Western medicine and psychiatry, and the development of new approaches in neuroscience, has led to a growing interest in scientific understanding of Buddhist meditation, and an ongoing dialogue between Buddhist practice and Western science. This chapter examines one aspect of this encounter between meditation and contemporary science, the ongoing attempts to classify and make sense of meditation techniques in scientific terms.

KEYWORDS

Meditation, Mindfulness, Neuroscience, Stress, Tantra

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What we now call Buddhist meditation grew up over many centuries in a variety of Asian contexts as a body of techniques and practices to assist in cultivating the central Buddhist goal of liberation from suffering. The early Buddhist sūtras give us valuable glimpses of early approaches to meditation. These incorporated practices from other ascetic traditions of the time, such as the well-known *brahmavihāra* meditations, as well as what were evidently new and original techniques based on Śākyamuni's unique personal vision (Bronkhorst, 1993; Analayo, 2017). Over the succeeding centuries, many meditation techniques were developed in particular regions and traditions. Practices were lost, rediscovered, and adapted to new situations. Classic texts were reinterpreted as the basis for new techniques, a process which has continued into modern times (Houtman, 1990; Braun, 2013). The growth of Tantric practices in India in the 8th to 12th centuries led to a vast array of new techniques and approaches, developed further over the centuries, particularly in Tibet. While retaining their central orientation towards the liberation of sentient beings from suffering, today's Buddhist traditions have developed a great variety and richness of different approaches to assist in following this path.

In recent times, some of these meditation practices, most notably the so-called mindfulness techniques, derived from modern forms of Vipassanā and Chan practice, have been adapted widely for therapeutic and general use in Western countries and indeed on a global scale (Williams and Kabat-Zinn, 2011). This process has brought about a direct encounter between Buddhist meditation practices and modern scientific disciplines such as psychiatry and neuroscience. A whole repertoire of specific therapeutic regimes and interventions has developed based on Western understandings of Buddhist meditation. These include such processes as Mindfulness-Based Stress Reduction (MBSR), Mindfulness-Based Cognitive Therapy (MBCT), Loving-Kindness Meditation (LKM), Mindful Self-Compassion (MSC), Cognitively-Based Compassion Training (CBCT), Compassion Cultivation Training (CCT), and the like (Baer, 2006). All this has led to a new, much more serious and widespread interest in meditation in the scientific community.

Here I shall look particularly at one aspect of this encounter between meditation and contemporary science, the ongoing attempts to classify and make sense of meditation techniques in scientific terms. As an anthropologist dealing mainly with Tibetan Buddhism, but also with the historical development of Tantric and other practices, this is a little outside my usual area of research. Recently, though, I have become involved in a research project based around an evaluation of a particular meditative regimen for nurses and health workers in the Sydney hospital system, and this has brought me rather directly face to face with some of what has been happening in this area.⁴² I was struck, for example, by the different ways in which my fellow-researchers understood meditation and mindfulness, and how they operated with these terms in the context of that classical procedure of contemporary medical science, the 'randomized controlled trial' or RCT. The development of the Western scientific understanding of meditation is an interesting topic in its own right, but it is also important because it influences how meditation-derived techniques are adapted for therapeutic purposes by psychiatrists, health and government agencies, and other relevant bodies. There are significant problems in this area (see e.g. Purser, Forbes and Burke, 2016), but also some interesting and promising developments.

The Western scientific understanding of meditation goes back primarily to one influential figure, the American cardiologist Dr. Herbert Benson, and his work on the so-called 'relaxation response' from the 1970s onwards (Benson, 1976, 1981). Benson was initially concerned not with

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Buddhist meditation, but with Transcendental Meditation (TM), a Hindu-derived mantra practice which was popular in the 1960s and 1970s. However, he rapidly came to see TM not as a unique practice but as one of a variety of cultural techniques intended to bring about this physiological response within the human organism. This created the dominant framework for viewing meditation for many years, both by scientists and by the lay population: meditation was assumed to be primarily a technique for relaxation and stress-reduction. This was also the framework within which Buddhist meditation, and the newly adapted meditation-derived practices such as Mindfulness-Based Stress Reduction (MBSR) were mostly understood. As I shall discuss below, a critique of this framework has developed over the last few years.

There is an important initial point to be made about Benson's approach and the scientific consensus to which it led. The Buddhist tradition does not see meditation (*bhāvanā*, or similar terms) as being primarily about relaxation or stress-reduction. Instead, it understands it as part of a path leading to liberation from *samsāra* and the attainment of Buddhahood. Benson and his colleagues were surely aware of this to some degree at least, but the developing scientific consensus viewed meditation as a set of techniques that could be readily detached from this cultural context and from the ways in which they had been traditionally understood. From this point of view, the development of MBSR was something of a watershed, leading to a period of greater engagement with the Buddhist tradition. MBSR's creator, Jon Kabat-Zinn, was himself a committed Buddhist practitioner, as were many of the people who popularised MBSR and the other new 'mindfulness-based interventions' (MBIs). In consequence, although the MBIs were designed as clinical interventions, they tended to incorporate more of Buddhist orientations and perspectives than did Benson's approach. In addition, the popularity of these MBIs rapidly led to a critical literature by Buddhist scholars and other regarding the extent to which MBIs were really 'Buddhist,' and whether they omitted important elements of the Buddhist perspective. However, before tangling with the conflict between scientific and Buddhist understandings of what meditation is for, we need to look more closely at the background to the idea of the 'relaxation response' itself, since this is based on a specific model of the human organism, and particularly of its response to stress, that had been developed by a number of European and North American scientists over the previous half-century.

Three key figures here were Walter Bradford Cannon (1871-1945), an American physiologist who originated the idea of the 'fight or flight' or 'ergotropic' response in 1915 to describe the physiological reaction of humans or other animals to attack or threat, Hans Selye (1907-1982), an Austrian-Canadian endocrinologist who developed much of the modern understanding of stress from the 1930s onwards, and Walter Rudolf Hess (1881-1973), a Swiss physiologist who identified an alternative response pattern, the so-called 'trophotropic' response, that formed the basis for Benson's 'relaxation response'. These people were physiologists, working primarily in neurology and endocrinology, and interested in issues such as the excitation of the nervous system, hormonal secretions and body chemistry. They were doing research, for the most part, with animal subjects, not with humans.

To start with Cannon's fight-or-flight response, the general idea here was that animals reacted to a situation of acute danger in a characteristic way, involving a general discharge (activation) of the sympathetic nervous system, which is the component of the autonomic nervous system that is involved with arousal. This led to the production of cortisone and adrenalin, bringing the organism into a high state of alertness so that it could either confront the threat physically or attempt to escape from it (hence "fight or flight").

Selye's contribution was to embed this response in a general theory of 'stress'. In fact, the modern usage of the word 'stress' owes much to Selye and his idea of a 'general adaptation syndrome,' in which human beings and other animals respond to 'stressors' in a uniform way irrespective of the nature of the specific form of stress:

The general adaptation syndrome consists of three phases. In the first phase, alarm, the person becomes mobilized to meet the threat. In the second phase, resistance, the person makes efforts to cope with the threat, as through confrontation. The third phase, exhaustion, occurs if the person fails to overcome the threat and depletes its physiological resources in the process of trying. (Taylor 2015: 114; see also Selye 1976: 5-6.)

One aspect of Selye's work was to assimilate 'psychological stress' to physical stress. In so doing he laid the foundations of mind-body medicine, but also helped create a generalized category of 'stress' which has become so familiar and naturalized within contemporary life that it is too easily taken for granted. In fact, the whole concept of stress becomes quite problematic if one looks more closely at it. The term has a kind of double reference, involving both something impacting on an organism, and the organism's response to that experience. In the words of one early commentator, Selye's stress concept, "...in addition to being itself, was also the cause of itself, and the result of itself." (in Humphrey, 2005, cited in Persson and Zakrisson, 2015: 149). For this and other reasons, Selye was a controversial figure, but his work made a major contribution towards the growing sense that 'stress' (whatever that might mean), and the ways in which organisms (animal or human) responded to it, were important factors in the genesis of disease.

The third of these key figures, Hess, identified a second and complementary pattern of response to the 'fight or flight' or 'ergotropic' response. This was the 'trophotropic' response, which also came to be known as the 'relaxation response'. It involved the other main branch of the autonomic nervous system, the parasympathetic. The parasympathetic nervous system promotes relaxation, reduced heart rate, respiration, skin temperature and so on. The idea here is that overstimulation of the ergotropic (fight or flight) response leads to damaging physiological consequences. The trophotropic or relaxation response provides the organism with an opportunity to recover. This is the structure of ideas which formed the basis for Benson's interpretation of meditation as being primarily a technique for inducing the 'relaxation' response.

As I noted, much of the actual experimental work here was done with animals (mainly mice, in Selye's case, and cats, in Hess's). It was very readily generalized to human beings. Certainly the 'fight or flight' response, with its high levels of stimulation and arousal, can be identified in human beings, and the negative physiological consequences of being in an aroused condition for prolonged periods of time are real. It is easy too to see contemporary life as leading to high and inappropriate degrees of overstimulation, and to see meditation as a way of coping with this situation. Subsequent researchers (e.g. Gellhorn, 1970; Fee and Girdano, 1978) have suggested that ideally human beings should achieve an appropriate balance between the two patterns of response.

However, there are some questionable simplifications in the model. Do animals, let alone human beings, react to all forms of 'stress,' physiological or psychological, in the same way? Does the autonomic nervous system always respond in such a straightforwardly uniform manner (cf. Izard, 1972: 8-9)? In particular, animal research necessarily tends to discount consciousness, since scientists have limited direct access to animal consciousness. For human beings, our reaction to the stressful situations of life are clearly mediated by consciousness. We experience them in terms

of emotion, and we respond to them with varying degrees of self-awareness (cf. Izard, 1972). What is the role of the emotions, and of consciousness more generally, in these processes?

For Benson, the relaxation response⁴³ was a kind of universal key, that explained not only TM and other forms of meditation but many other cultural processes. Where his data did not fit, as was the case for example in his well-known research on the Tibetan *gtum-mo* or psychic heat practices, he simply neglected the discrepancy (Amihai and Kozhevnikov, 2015: 7). In part, this may have been because of Western cultural biases. Particularly in the 1960s and 1970s, Asian cultures were seen as an alternative path to the supposedly stressful and hyperactive social contexts of Western capitalism. In any case, research on meditation in the 1970s was a marginal area, and not taken very seriously by the general scientific establishment.

All this began to change in the later 1990s with the development of sophisticated neuroscience procedures such as functional magnetic resonance imaging (fMRI), on the one hand, and of well-established and widely used therapeutic interventions based on Buddhist meditation, such as MBSR, on the other. While the stress and relaxation paradigm continued to dominate, key figures behind the new approaches, such as Jon Kabat-Zinn, creator of MBSR, or John Teasdale, whose ‘Interacting Cognitive Subsystems’ model contributed to the development of Mindfulness-Based Cognitive Therapy (MBCT), attempted to develop new and more sophisticated models which incorporated a sense that meditation could promote higher levels of self-awareness (Kabat-Zinn, 2011; Teasdale & Chaskalson, 2011). Kabat-Zinn came to refer to his own programme as ‘Mindfulness-Based Stress Reduction’ (the original name was the Stress Reduction and Relaxation Programme) in part for this reason (Kabat-Zinn, 2011: 286) and has claimed that he saw the programme all along as “one of a possibly infinite number of skillful means for bringing the dharma into mainstream settings” (281).

Arguably, in both cases, the neuroscience research and the mindfulness-based interventions, there has been more promise than performance so far. The data derived from fMRI, despite the massive publicity surrounding the technique, is still of fairly limited reliability and usefulness as a witness of brain activity (see e.g. Chen, 2013; O’Herron et al., 2016). Research using fMRI has led to some interesting hypotheses about the functioning of the brain, but it has arguably not got us much further in terms of understanding how meditation works (Garfield, 2011). As for the mindfulness-based interventions, a large body of research has also given us a limited amount of solid data, in part because of naïve and uncritical experimental approaches (Chiesa and Serretti, 2010; Goyal et al., 2014). However, that picture is beginning to change, on both sides, and if neither the brain scans nor the mindfulness movement have got us as far as their more optimistic promoters predicted, they are least opening up modern science to a more meaningful and genuine encounter with a very different body of both theory and practice.

Here the word ‘mindfulness,’ which certainly proved a very successful label for what has by now become a very large-scale phenomenon, has itself been part of the problem. ‘Mindfulness’ here functions as an equivalent for Pali *sati*, Sanskrit *smṛti*, but arguably those terms, for most Buddhists of the past and today, did not refer to the kind of bare awareness cultivated in MBSR and similar practices. This issue has been discussed at length by many commentators (see e.g. Dreyfus, 2011) and I shall not pursue it here. One of the major problems of ‘mindfulness’ or ‘meditation’ as an overall term for Buddhist practice, however, is that it creates the sense that there is a single relatively straightforward process or practice within the Buddhist tradition to which the

⁴³ It should be noted that Benson spoke of the ‘relaxation response,’ referring to a specific set of physiological responses of which relaxation was part, not just of ‘relaxation’. My impression is that this distinction rapidly became blurred, particularly in the more popular literature.

terms refer. Scientists without any personal grounding in the Buddhist tradition were particularly liable to this kind of misunderstanding, since they expected a simple, straightforward explanation of ‘meditation’ which made sense in English or another contemporary European language. The Kabat-Zinn model of mindfulness as bare embodied awareness provided what they were looking for, but in reality it was far too simple a model to cover the great variety of practices and techniques within the Buddhist tradition.

Fortunately, perhaps, many of the Western scientists involved in research on Buddhist and Buddhist-derived techniques were better informed than this. This is particularly true in the area of neuroscience, where many of the key figures had significant personal experience of meditation. In 2008, an article by Antoine Lutz, Heleen Slagter, John Dunne and Richard Davidson suggested a distinction between “two broad categories” into which “some standard meditations are grouped”. They labelled these “focused attention (FA)” and “open monitoring (OM)” (Lutz et al, 2008: 163). The distinction corresponds to that between *samatha* and *vipassanā* in Pali, *śamatha* and *vipaśyanā* in Sanskrit. This distinction was taken up rather quickly by other researchers, and further forms of meditation were added with appropriate acronyms, notably loving-kindness meditation (LKM, corresponding to *metta-bhāvanā*; e.g. Lippelt, Hommel and Colzato, 2014). On the practical side, techniques such as LKM started to be used increasingly as a complement or alternative to the bare awareness practices which dominated the early years of the ‘mindfulness movement’.

There are still some problems here. *Samatha* and *vipaśyanā* are terms that are used with various meanings across Buddhist traditions, and indeed even within sub-traditions. Thus, the equivalent Tibetan terms, *zhi gnas* and *lhag mthong*, have been reinterpreted by successive schools and scholars, as with the 18th century scholar Jigs med gling pa’s critique of the dGe lugs pa understanding of these terms, and they do not necessarily imply the same contrast or the same referents in different traditions (Samuel, 1993: 509, 535). LKM in contemporary usage can also cover a variety of possibilities, and often conflates the rather different meditational techniques of *metta-bhāvanā* and *karuṇā-bhāvanā*. However, the awareness was growing that ‘meditation’ covered a considerable variety of different techniques of mental cultivation.

Although Kabat-Zinn, Teasdale and others had introduced formulations that were intended to replace the more simplistic versions of the ‘stress’ and ‘relaxation response’ frame, the relaxation model of meditation continued for a while to be widely accepted. Articles began to appear however that more directly questioned the appropriateness of this frame. In 2007, Antoine Lutz, John Dunne and Richard Davidson had already argued against seeing Buddhist meditation as being primarily about ‘relaxation’:

In most practices, the ideal meditative state – one beyond the novice stage – is a state in which neither dullness nor excitement occurs; in short, stability and clarity are balanced perfectly. Hence, for the Tibetan contemplative traditions (and indeed, for nearly every other Buddhist tradition), it would be incorrect to interpret Buddhist meditation as “relaxation.” This is not to deny the importance of mental and physical techniques that help the practitioner relax. Without such techniques, an excess of physical or mental tension may develop, and when such tension occurs, excitement will almost certainly arise. If, however, such relaxation techniques are overused, they are likely to propel the practitioner into dullness and hence hinder the meditation. Indeed, from a Buddhist perspective a practice that only relaxes the mind might eventually prove harmful. (Lutz, Dunne and Davidson, 2007: 507)

Willoughby Britton, Jared Lindahl and others published an article in 2014 with the challenging title, ‘Awakening is not a Metaphor,’ arguing that to see Buddhist meditation as primarily about achieving a relaxed state is fundamentally mistaken, and that modern applications of meditation had systematically overemphasized the significance of this dimension of the practices (Britton, Lindahl et al, 2014). They reviewed the literature on meditation research, pointing to evidence that the practices lead in time to greater wakefulness, as one would expect from Buddhist sources. They also introduced an important distinction between two kinds of alertness, technically known as ‘tonic alertness’ and ‘phasic alertness’ Tonic alertness is a state of sustained wakefulness which can be associated with relaxation and parasympathetic activation, while phasic alertness is a shorter-term form of alertness linked to arousal and the sympathetic system. However, they suggest that the two forms of alertness can over time be mutually reinforcing, implying that a simple opposition between relaxation and arousal is unlikely to provide an adequate description of the neural aspects of meditation.

Also in 2014, Ido Amihai and Maria Kozhevnikov, who work at the National University of Singapore, published the first of two articles presenting the results of a comparative study of four meditation techniques. Two of these are in the “focussed attention” category (a Theravādin *kaṣiṇa* practice and Tibetan deity yoga) and two are of the “open monitoring” type (a Theravādin-style vipassanā practice and a Tibetan rDzogs chen practice). The results suggested that the most significant contrast was not between the focussed attention and open monitoring practices, but between the Theravādin and Tibetan practices. The two Theravādin practices primarily evoked the parasympathetic nervous system and led to relaxed and low-arousal states, while the two Tibetan practices engaged the sympathetic nervous system and involved relatively high-arousal states. Both in fact could increase alertness or wakefulness, but along the two different pathways of tonic and phasic alertness (Amihai and Kozhevnikov, 2014; see also Amihai and Kozhevnikov, 2015).⁴⁴ Another group of researchers, associated with Tania Singer at the Max Planck Institute in Leipzig, again working on a project that involved several different styles of meditation (breathing meditation, loving-kindness meditation and observing thoughts) picked up on Amihai and Kozhevnikov’s results, arguing that the three kinds of meditation with which they were working, all in fact associated primarily with the Theravāda tradition, differed in the degree to which they involved relaxation or arousal (Lumma, Kok and Singer, 2015).

Two further articles published in 2016 took the argument somewhat further. Jeffrey Lidke’s ‘The Potential of the Bi-Directional Gaze’ (Lidke, 2016) is actually based on Śaiva tantric material, not Buddhist, specifically on the work of the great 10th century Kaśmiri Tantric philosopher Abhinavagupta. However, as a paper by Jeffrey Ruff, delivered in the same conference panel, pointed out, Lidke’s argument can easily be extended to Buddhist Tantric material (Ruff, 2016). Lidke argued that Tantric *sādhanā* in the Śaiva tradition is a form of training of the autonomic nervous system. Specifically, this training, through the outward gaze and inward meditative gazes of the title, involves a balancing of sympathetic and parasympathetic nervous systems, in order to ‘harness the potential,’ in Lidke’s words, ‘that comes from a simultaneous activation of these deeply integrated neurological systems’ (Lidke, 2016: 5). Lidke refers to Amihai and Kozhevnikov, and his article is a critical response to their work, suggesting that a more detailed

⁴⁴ One significant aspect of Kozhevnikov’s research was that it was carried out with a relatively experienced group of meditators. Much of the earlier research, particularly the many hundreds of evaluations of mindfulness-based interventions, were carried out on people who were in terms of Buddhist understandings of meditation in the very early stages of practice. As Britton, Lindahl et al point out (2014) it seems likely that relaxation may dominate in these early stages, and that higher levels of wakefulness may be characteristic of later stages of practice.

‘listening’ to the Tantric texts would suggest the need to go beyond the either/or logic of sympathetic and parasympathetic nervous systems.

There is more to Lidke’s article than I can discuss here, but I would point particularly to its applicability to Vajrayāna (Buddhist Tantric) meditation. The equivalent in Vajrayāna Buddhism of the inward and outward gaze of Abhinavagupta’s Śaiva tantra practice can readily be found both in the structured and symmetrical imagery of Tantric deities and Tantric maṇḍalas, and especially in the so-called completion stage processes, which involve the so-called ‘subtle body’. These processes consist of the balancing of the two outer channels that wind around the central channel of the subtle body, and the gradual bringing of subtle fluid into the central channel. Lidke’s argument suggests that they can be seen as a kind of training of the autonomic nervous system.

The idea that the so-called *cakra*-s and *nāḍī*-s of both Śaiva and Buddhist Tantra, wheels and channels within the body, through which subtle substances flow, can be seen in some such way has been around for a while, and I think it is worth taking seriously. I referred to it myself in an article published 1989 on the Body in Buddhist and Hindu Tantra (Samuel, 1989) and again in a book from four years later (Samuel, 1993), and I discussed it again in a recent edited volume on the subtle body in Asian and Western cultures (Samuel, 2013). As I pointed out then, gaining control over aspects of the autonomic nervous system also involves control over aspects of the endocrine system, which is quite literally a matter of internal flows. One of the interesting aspects of this approach is that it allows one to see traditional Tibetan or Śaivite models, on the one hand, and contemporary scientific understandings, on the other, as mutually compatible approaches expressed in somewhat different conceptual languages.

Certainly, this makes more sense than the more usual approach, in which the *cakra*-s and *nāḍī*-s are seen primarily as a pseudo-scientific description of an imaginary physiology. Visualising and learning to operate with the subtle body is, for the Tibetans, a constructive process rather than a descriptive one – its intention is to bring about an inner transformation. The various Tibetan lineages of teaching use different visualisations of the subtle body, and the required visualization may also change at different stages of the process. This suggests strongly that the Tibetan accounts of the subtle body are not to be taken as literal physiological descriptions, but as guides to a variety of differing internal practices relating to gaining control over the autonomic nervous system. Such a model allows us to steer a middle way between Western science in its present form and traditional Asian knowledge – which in fact was not as fixed as is often supposed (cf. Samuel, 2013) – as well as offering possibilities for a constructive rethinking of Western scientific assumptions.

At any rate, it is clear that any attempt to describe the current state of scientific understanding of meditation processes is likely to be rapidly outdated. This paper is at best a snapshot of a moving target, and has doubtless omitted more than it has included. What is apparent though is that an initially relatively straightforward assimilation of ‘meditation’ as a whole to a specific category within Western neurophysiology (the ‘relaxation response’) has led to an increasingly sophisticated search for models which can capture more of the complexity and subtlety of meditation processes in the Buddhist and other related traditions. This search is also bringing us to a point where Buddhist meditation is no longer simply a source of techniques to be appropriated into scientific frames of analysis, but a source of knowledge as to the underlying processes behind those techniques that can enter into productive dialogue with scientific understandings. It seems likely that the next few years will take this process considerably further.

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