

Vipassana for Hackers

The Proposal

Version 0.1

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Vipassana meditation claims to ultimately explore the entire field of mind and matter, with the goal of total liberation from suffering. Implicit within this claim is a complete understanding of human consciousness. This is a difficult claim to prove or disprove because the time commitment required to research the technique orders on multiple decades — if not multiple generations. Only a longitudinal study has any meaning. This is complicated by the fact that the time commitment is demanded of both the researcher *and the subject*. Until now, research on meditation of all kinds has covered only one of two fields: (1) controlled experiments which must inherently rely on superficial data gathered from beginners [11, 16, 17, 30] and (2) observational exploratory research of monks — expert meditators who have dedicated their lives to the practice. [12, 24]

I propose bridging this gap by submitting myself to the middle ground. While remaining a layperson, I will commit to a high ratio of waking meditation hours. Individually and internally, I will conduct qualitative research into the consequences of Vipassana meditation and the nature of consciousness. Collectively and externally I will pledge myself as a subject for long-term quantitative studies with a broader community of researchers.

Keywords: neuroscience, psychology, vipassana, meditation

TODO LIST

I. INTRODUCTION

Research into the effects of meditation has been conducted in earnest for half a century but the quality of research in this field varies wildly. Randomized controlled trials were missing from much research conducted during the first few decades of meditation study. The importance of active controls was often missed even when randomized controlled trials were attempted. Double-blind studies are inherently impossible with meditation research; a subject will always know if she is receiving meditation instruction or an active control instruction. [18]

Add to these difficulties the very nature of meditation research itself. There are many techniques of meditation and it is very important to capture the specific technique under study to make meaningful assertions about its effects. [18] However, even within the definition of a single meditation technique there exist variations in instruction between teachers and each student’s comprehension of the instructions received. [9] Even if researchers could cement (or at least accurately record) semantics and terminology, the subject of study is often unclear: Are we looking for health benefits? Increases in productivity? Increases in intelligence? How long these effects persist? How much do we want to explore concrete hypotheses

versus exploratory analysis of long-term effects? How much can be learned about the nature of consciousness? Can these learnings be measured objectively or even communicated meaningfully?

Because Vipassana ¹ is globally standardized, it affords researchers with definitive solutions to the difficulties presented by varying teaching methodologies. In exchange for this, the difficulty of long-term study is compounded by the intrinsic seriousness demanded of a Vipassana practitioner: the Pāli concept of *ātāpī sampajāno satimā* (continuous piercing awareness of constantly changing bodily sensation [1, 14]) is not only a requirement of serious Vipassana practice but could very well act as a surrogate description of the practice itself. This seriousness poses obvious difficulties and it is the intention of my study to begin breaking ground in solutions to those difficulties.

This study will prove significant in three fields of research:

First, and most accessible, is the continued quantitative research of meditation in the broader neuroscience and psychology disciplines, where my participation will be more as subject than researcher.

Second is the qualitative research into the long-term consequences of Vipassana meditation, what it reveals

¹For the remainder of this research proposal, “Vipassana” will always refer to the specific technique “Vipassana as taught by S.N. Goenka in the tradition of Sayagyi U Ba Khin” and lineage-identical instruction, such as that taught by Ledi Sayadaw (in writing) or other students of U Ba Khin contemporary to S.N. Goenka, unless noted otherwise.

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about the nature of human consciousness, and reusable techniques for its exploration — a field currently consisting of a bridge between psychology, philosophy, linguistics, and contemplative studies.

Third is the exploratory research intended to objectively define consciousness. As such research must pertain to all forms of consciousness it therefore includes all non-human forms of consciousness. Findings will inform our understanding of the Mind-Body Problem of psychology and philosophy, the entire field of bioethics, and — perhaps most importantly — the nascent field of Artificial Consciousness as a subfield of Artificial Intelligence. [20] As of this writing, this overarching integral field of study has yet to emerge and has no name as a discipline.

II. PROBLEM STATEMENT

A. Overview

There is a dearth of high-quality scientific meditation research. Due to decades of misunderstanding the subject, it's estimated that — of the 50,000+ papers published on the broad topic of “meditation” — only a few dozen conform to scientific rigour. [13, 18]

There are exceptions. Notably, Richard Davidson's 2002 study on Minyur Rinpoche and the subsequent EEG and fMRI studies of serious Tibetan monks. [24] There have also been effective double-blind trials of householders (the laity), predominantly studying Mindfulness-Based Stress Reduction (MBSR) and Mindfulness-based Cognitive Therapy (MBCT), which represent two very mild techniques of meditation.

Sampling from the extremes is a natural consequence of the accessibility of subjects. Contemplative monks, serious in their meditation practice, are not easily accessed. Modern householders tend to peak at 2 or 3 hours of meditation per day, due to other responsibilities. This is the dichotomic choice in meditation research: either sporadically studies monks, who can have tremendous meditative capacity — or regularly studies householders, who have little to none.

Bridging this monastic / householder divide requires individuals willing to (a) dedicate themselves to long periods (years or decades) of continuous meditation practice with a single technique and (b) submit themselves to continuous scientific inquiry.

B. Hypothesis

As far as quantitative measures, such as future EEG, MEG, and fMRI readings, are concerned, this study hypothesizes that readings taken from subjects will progress toward readings found in “expert” groups of previous studies. [12, 24] See *RESEARCH DESIGN AND METHODS, Expertise*.

However, both quantitative and qualitative measures will be used primarily for initial discovery and exploration. Since no other study of this kind has ever been run, it is not possible to meaningfully predict outputs. See *RESEARCH DESIGN AND METHODS, Methodological Issues*.

III. OBJECTIVES AND AIMS

A. Overall Objective

As an “ultralong” longitudinal study of continuous practice, the primary goal is open discovery.

Most pre-existing studies on meditation focus on narrow outputs of the practitioners' meditation activity. Qualitative examples include effects on emotional regulation, negative self-belief, depression, anxiety, and amygdala response outside of meditation. [11, 16, 17] Quantitative examples include discovery of high-amplitude gamma synchrony during meditation, higher Parietal-Occipital EEG gamma activity during NREM sleep, Heart Rate (HR) and High-Frequency Heart Rate Variability (HF-HRV) as useful proxies for effort, and meditation experience correlated to reduced Default Mode Network (DMN) activity. [6, 12, 23, 24]

This ultralong study will, instead, examine all aspects of prolonged practice of Vipassana meditation. Qualitative outputs will begin after the first quarter of the study. Quantitative outputs will emerge as long-term access to research equipment becomes available.

B. Specific Aims

The study will produce qualitative writing describing the research-subject's experience.

The study will produce quantitative measures, based on equipment availability.

The study will also act as a template study methodology for others to follow, or for other researcher-subjects to join if the study proves successful in uncovering new discoveries.

There has been limited, unprofessional writing on the topic of the dangers of meditation. [21, 31] Even though these writings focus on Christian ideals, struggles of faith, and meditative concepts (such as “The Dark Night of The Soul”), which have no relationship to meditation whatsoever, they do arise in discussions of meditation from time to time. As a result, it is a specific aim of this study to determine if there are psychological or physical dangers presented by prolonged meditation practice.

IV. BACKGROUND AND SIGNIFICANCE

A. Preliminary Research Review

Related research, as mentioned previously, falls on the spectrum of exploratory research conducted on “expert” (50,000 hours of practice or more) meditators in various traditions or acute, quantitative research conducted on novice (0 - 10,000 hours) or intermediate (10,000 - 50,000 hours) meditators.

The strength of each form of study is demonstrated in its results. Exploratory research has given us a clear understanding that the brains of very experienced meditators function in a manner very different from the societal mean. Quantitative research with a narrow hypothesis has provided repeated statistical evidence that meditation practices do change the minds and bodies of the participant, and that those changes are measurable. Statistical research has also taught us that the effects of many meditation practices become more pronounced with a prolonged practice period.

Longitudinal studies have largely not been conducted in the various fields of meditation research. Where they have been conducted, “longitudinal” may only represent a period of nine months. Generally, these longitudinal studies focus on larger groups of novice meditators. While useful in its own right, this is equivalent to studying hobby pianists for long periods of time: none of the subjects will ever master the piano.

True longitudinal study of an individual (or individuals) will allow for a new form of exploratory research, which will itself uncover new questions we might ask of meditation. We can then probe with further statistical research once we know what questions we want to ask of the technique or techniques under study.

B. Why Vipassana?

Vipassana is a “complete” system of meditation, based on two premises:

1. that every mental and emotional formation in the consciousness of an individual corresponds to an equivalent physical formation in the bodily sensations of that individual and
2. that the totality of physical, bodily sensations are open to exploration by the method of self-directed human awareness

These premises can be experientially validated, and are thus known to be true. As with all experience-oriented factual information found in the fields of consciousness studies, we must operate based on the assumption that if a third party wishes to validate these premises, they can and will do so experientially. This presents a difficulty, but not an insurmountable one, as we’ll see below.

1. Standardization and Access

Vipassana meditation is a globally standardized meditation practice. It is taught based on the same instructions across the globe, and has been translated into dozens of languages, covering the vast majority of global society. Those instructions are taught verbally, via audio and video recording, and do not require the participant to be literate in the language they speak. Introductory courses in Vipassana meditation are all identical, covering a 10-day period in which meditators participate in complete silence, devoid of external input and confounding variables.

These introductory courses (as with all Vipassana meditation courses) are taught completely free of charge, making access universal.

The only limitation to access is the mental and physical fitness of individuals applying to take Vipassana meditation courses. Course management will, at their discretion, request someone not to take a course if they suffer from mental illness, for example.

2. Purpose of Practice

The intended purpose of Vipassana meditation is inherently supramundane: “the total eradication of suffering.” While this purpose may appear unreasonable or unattainable to skeptics, it is not scientific to judge the potential outcomes of such a meditation based on our assumptions. We must instead test the methodology of Vipassana meditation to see how it holds up to these claims, and to what degree.

Conversely, the purpose of many contemporary meditation techniques (particularly those studied in existing literature) is inherently mundane: to improve sleep, to reduce anxiety, to reduce PTSD, and so on. While some of these effects may be visible in the study of Vipassana meditation, they are not the end goal of the technique under study.

C. Why now?

Instruction in Vipassana meditation has been available outside of Burma / Myanmar since 1969. However, it has taken five decades of proliferation at the hands of volunteers to make Vipassana meditation accessible to large portions of the globe. Even though there are permanent Vipassana Centres (teaching schools) in many countries worldwide, there is still extremely limited presence in Africa and the Middle East, though there is widespread interest there.

10-Day introductory courses in Vipassana meditation have long waitlists in all of these Centres. Demand for instruction in Vipassana meditation far outstrips supply.

Vipassana instruction is clearly on a path of growth, at present. With a globally-accessible technique of medi-

tation which is increasingly discussed within the scope of popular culture, it is an appropriate time to study its effects for the benefit of the global population. [25, 26, 29]

Outside the scope of Vipassana meditation, the broader topic of “meditation” has received a great deal of confused analysis in recent years. Many authors will make the mistake of confusing their own subjective analysis of their personal experiences as somehow objective, or present it as such. [4, 21] It is also an appropriate time to clarify the conclusions of such confused analysis.

V. RESEARCH DESIGN AND METHODS

A. Overview

As the structure of studies conducted on Vipassana is inherently very difficult, due to the strict nature of Vipassana meditation instruction, we must first examine which kinds of studies are possible, which are not, and what will make possible studies worthwhile.

1. Expertise

A large scale controlled study of beginner-to-intermediate students of Vipassana, each practicing a minimum of two hours daily, is possible. Randomization will not be possible in such a study as the students self-select this meditation technique for themselves. The recommendation to practice the technique “a minimum of two hours daily” is a component of instruction, given to students even on the most basic 10-day introductory course. [3, 15] As such, it is possible to conduct such a study on students who have dedicated themselves to the practice of Vipassana in the manner recommended — and an increasingly large number of Vipassana meditators do so, worldwide.

However, such a study suffers from the very nature of the instruction and its target audience. On the lifelong scale of Vipassana practice, the spectrum spans from a minimum of laypeople practicing two hours per day to a maximum exemplified by renunciates (monks and nuns) who practice up to twenty-four hours per day once they reach the advanced stage where deep sleep no longer occurs. It is also worth noting that a junior renunciate will still have less *experience* than a senior lay meditator, which means that the only objective measure of experience is total number of hours meditated. [18]

Meditation research often has difficulty defining and capturing *expertise*, however, and total hours of experience is still confounded by the rate in which those hours of experience are accumulated (hours per day). We must capture both, as accurately as possible. Renunciates potentially have both a high hours-per-day rate and extended (lifelong) duration of experience. The existence of renunciates forces the very broad category of *expert* meditators into the territory of 100,000 hours of practice,

even if we limit practice hours to formal, sitting meditation and estimate twelve (12) hours per day. If we take the much more modest rate of six (6) hours per day, assume an adult renunciate can learn Vipassana, at the earliest, from approximately 20 years of age, and is now of an age when they may participate in an extended study (say, 40-60 years of age), we arrive at roughly 60,000 hours of practice. We can reduce this number to 50,000 to match the upper-bound of groups categorized in studies by Lumma and Brewer. [6, 23] If we use the oft-cited “10,000 hours” measurement for competence in a subject, we might reasonably describe our rough spectrum of expertise as such:

- Beginner: 0-10,000 hours
- Intermediate: 10,000-50,000 hours
- Expert: 50,000+ hours

As a consequence, even studies which claim to observe “expert” or “long-term” Vipassana meditators are often predominantly observing beginners (7.9-8.6 mean years of experience with 2 hours of daily practice). [7]

2. Methodological Issues

This is in addition to a large number of other methodological issues with studies of Vipassana, as described by Alberto Chiesa in *Vipassana Meditation: Systematic Review of Current Evidence*, 2010. [7] These include the lack of: study replication, randomized trials, active plus inactive controls, and double/single blinding.

Chiesa also notes that it would be beneficial to capture data “both from a clinical and from a neuro-imaging point of view”, including functional magnetic resonance imaging (fMRI) and electroencephalography (EEG), for both short-term outcomes (altered states) and long-term outcomes (altered traits [8]) to improve future Vipassana research. [7] Optically-pumped magnetometer (OPM)-based magnetoencephalography (MEG) performed using a mobile helmet capable of operating at room temperature [5], in development since Chiesa’s paper was published, may permit it as a third neuro-imaging technique. Even older MEG technology based on superconducting quantum interference devices (SQUIDS) could potentially be used. The restriction of SQUID-based MEG is that subjects must remain extremely still, but this is all but a requirement of serious Vipassana meditation anyway.

Because Vipassana does not permit any form of imagination, any attempt to analyze it through philosophical phenomenology becomes a hindrance to actually practicing Vipassana. [27] The two are mutually exclusive, as is any attempt to contemplate Vipassana, the phenomenology of the mind, or the technique, during the actual practice of Vipassana. I have previously discussed this apparent paradox in Appendix A of *Vipassana for Hackers, Paper One: Curious Mechanics*. [10]

Last, statistical study of Vipassana, at the intermediate level, is currently not possible. Meditators who are in the process of transitioning from 10,000 hours of experience to 50,000 hours of experience are not readily available as research subjects in significant numbers. Because we have not studied such meditators, we are as of yet not exactly sure what we might be studying when we do study them. V.S. Ramachandran put this most succinctly:

“I can’t think of a single discovery of disease which had more than one initial sample. ... You can’t do statistical analysis of an initial discovery.” [28]

3. Meditation as Research Tool

A lifelong study of a single, increasingly-experienced Vipassana meditator is, in essence, an exploratory process of discovering what researchers might be bothered to study in a controlled trial with both active and inactive controls and (single) blinding, over a much larger sample. This exploratory process has been described by Goleman and Davidson in *Altered Traits*:

“Perhaps one day an ultralong study will give us the equivalent of video on how altered traits emerge. For now, as the Brewer group conjectured, meditation seems to transform the resting state—the brain’s default mode—to resemble the meditative state.

Or, as we put it long ago, the after is the before for the next during.” [18]

The demands of such an “ultralong study” were echoed by Harari in *21 Lessons for the 21st Century*:

“Some universities and laboratories have indeed begun using meditation as a research tool rather than as a mere object for brain studies. Yet this process is still in its infancy, partly because it requires an extraordinary investment on the part of the researchers.” [19]

The line between “mere object for brain studies” and “research tool” begins to blur when we consider using meditation for both simultaneously. However, we would be remiss not to gather whatever objective EEG/fMRI/MEG data from the long-term subject-researcher when that data is so readily available.

4. Summary

Because Vipassana meditators are inherently self-selecting, double blind trials are not possible, nor are randomized trials. Single blinding is possible, and should

be employed in future studies where it is feasible. Combination active/inactive controls are also possible for all *statistical* studies on Vipassana.

The study proposed is an ultralong (lifelong) study of an individual — myself. There is potential for others to join this ultralong study, should it show promise. As far as quantitative data gathered from brain scans is concerned, I am effectively making myself available as a human guinea pig. As far as qualitative data is concerned, research will take the form of a deep case study. As I will represent Ramachandran’s “initial sample”, statistical analysis will not be relevant. If the study proves productive, future studies targeting a specific hypothesis about Vipassana in a large sample can use learnings from this study in their statistical structure.

B. Study Design

1. Qualitative Measures

Qualitative research into the specific nature of human consciousness or the broader nature of consciousness as it applies to any organism or artificial intelligence can only be performed directly. In this case, a case study performed by an individual (myself) will explore the question of consciousness and the mind-body problem directly, through Vipassana meditation, for a prolonged period of time. Many theories and questions currently exist regarding consciousness, such as *Theory of Mind*, *Theory of Panpsychism*, *Theory of the Entropic Brain*, the *Simulation Hypothesis*, etc. This study will not address any one of the many theories of consciousness directly, nor will it absorb any specific hypothesis. The data recovered from practicing Vipassana meditation directly for prolonged periods of time will almost certainly overlap with many such ideas but themes and narratives are likely to be emergent, rather than conforming to an existing hypothesis of consciousness.

Phenomenology, in the broadest sense, may be used to describe experiences as they pertain to a lifelong trajectory of altered traits. Phenomenological descriptions of deep meditative states, or even of altered traits, is not the goal, however. If other narrative tools emerge over the course of the study, I will augment phenomenological descriptions and imagery with those tools.

Vipassana’s instruction provides us with claims we can evaluate: “[Vipassana] explores the entire field of mind and matter” [14], “[Vipassana] is a technique that will eradicate suffering” [2], and “Vipassana aims at ... total liberation and full enlightenment” [2]. Progress made in evaluation of these claims will be, by its very nature, emergent.

The validity of these emergent observations made during the qualitative portion of the study can be asserted across most axes of validity: prolonged engagement, rich descriptions, external audits (from more experienced meditators), identification of researcher bias, peer de-

briefing (again from more experienced meditators), and searching for discrepancies in evidence are all possible. Respondent validation (member checking), although possible, may not carry much weight in terms of strengthening the validity of the study, given an initial sample of one. Triangulation will not be possible with a sample of one. If the study proves productive, in the future additional researcher-subjects intent on a lifelong Vipassana practice may strengthen respondent validation and triangulation for parallel studies. Triangulation of qualitative analysis of consciousness suffers from the paradox that any individual's consciousness is only directly observable by that individual and conclusions — even those validated by triangulation — will always be in the third-person.

Data will be collected on a daily basis and themes and narratives regularly collected with the intention of describing mental phenomena and the evolution of traits as Vipassana practice progresses. Monthly or yearly schedules will be decided with a study supervisor but an example daily schedule is available in *Appendix 1: Example Daily Schedule*.

2. Quantitative Measures

Measurements performed during the qualitative study will be used to create a dataset upon which later inferences will be based. Measurements taken throughout the study will be subject to equipment availability, and as such will only be taken based on the future availability of the same equipment.

In general, quantitative measurements will be taken by additional researchers, as the study progresses. This study is, in and of itself, not intended to interpret quantitative measures of brain activity or otherwise. Interpretation will be left to researchers familiar with such data, but raw data will be publicized.

The simplest data available is from off-the-shelf EEG machines, available to the general public with open-source hardware and open APIs, such as those sold by BlueBCI², making raw data easily and permanently accessible to the study. More advanced EEG machines will require partnership with a university or research group in the future.

ECG data producing HR and HF-HRV data can be collected from off-the-shelf systems such as the Zephyr Bioharness 3³, previously validated against physiology monitor systems used in laboratories. [22]

fMRI scans are available at commercial diagnostic laboratories in India for as little as \$100 USD per scan. MEG, as a newer technology, will likely require a university partnership.

C. Population and Study Sample

Initially, only one researcher-subject will be used in this study.

Additional researcher-subjects will be added to the study in the future if such persons are found capable of dedicating themselves to the task.

D. Collection of Data

Initial data collection will be done in the form of experiential reports.

E. Data Management

Data will be the intellectual property of Atapi Research Inc.

Data will be stored and backed up in raw formats produced by diagnostic equipment under a version controlled data store.

F. Participants

Initially, the only participant in this study will be me (Steven Deobald). In the future, additional researchers or research-subjects may be added to the study.

1. Why Steven Deobald?

My willingness to submit myself to this study, for the length of time required, is based on a number of factors.

First, I have been exclusively practicing Vipassana meditation for over 10 years. I have taken month-long courses, and will commit myself to taking courses of one or two months every year for the duration of the study.

Second, I am in the peculiar position of having severe eye damage due to a failed surgery in 2014. Although I can still use computers (and will need to do so to write experience reports), it causes me quite a lot of physical harm to use computers for extended periods of time. A severe light sensitivity also caused by the failed surgery means that, peculiarly enough, my eyes are most comfortable when they are closed in a dark room.

Third, I have been considering this form of research since 2016 — nearly 8 years at the time of this writing. I have also seriously considered monastic life, but ordaining as a monk is limiting in terms of scientific output and there is no monastic order under the Vipassana lineage yet.

Last, after 10+ years living in India, I am literate in the Devanagari script and familiar with the Pāli language, which all original Buddhist texts are written in. While researching meditation directly, it will be important to

²<https://bluebci.com/>

³<https://www.zephyranywhere.com/>

check findings against the original teachings to validate my understanding before publishing it.

G. Ethics and Human Subjects Issues

The ethics of undertaking such a study are personal until and unless another researcher-subject gets involved. At that point, those individuals will need to assert for themselves that this is definitely a process they want to undertake.

That said, there are some personal ethical constraints to address.

The study will leave little room for any other activity. It is likely that other past-times will need to be nearly eliminated to pursue the study in earnest. “Weekends”, as a concept, won’t really exist in a study which is intended to operate continuously.

Other factors which are declared monastic rules, but which seem natural while practicing deeper meditative states, may come into play. Monastics are celibate and do not listen to music. They are also not permitted to run. While I do intend to become a celibate, eliminate physical exercise, or stop listening to music, I am cognizant that these are risks of taking a meditation practice serious to this degree.

1. “Getting Paid to Meditate”

On the subject of *societal* ethics, the topic of “getting paid to meditate” has been one I’m acutely aware of, and one that other commentators on the study have mentioned as well.

If the intention of the study were only to engage in the act of full-time meditation, I would ordain as a monk. At present, the system of rules laid out by most monasteries still reflect those of the Vinaya: a minimum period of 5 years is required to live and practice independently.⁴ Still, if I did not care to publish my investigations into Vipassana meditation, five years of life is a small price to pay for the independence to practice continuously. [32]

However, the purpose of financing this study by sponsorship is to pay for its outputs, not its inputs. Sponsors who participate are justifiably expecting that the study will produce readable outcomes, of which they will be the first recipients.

H. Timeframes

VI. STRENGTHS AND WEAKNESSES OF THE STUDY

VII. RISKS

* devolves into performance art * line between science / art is blurry * forced to take robes * financially unsustainable

VIII. PUBLIC HEALTH SIGNIFICANCE

IX. BUDGET AND MOTIVATION

- resources required

X. CONFLICT OF INTEREST STATEMENT?

XI. REFERENCES

XII. APPENDICES

A. Appendix 1: Example Daily Schedule

EXAMPLE:

05:00 - Wake
05:30 - 1 hour meditation
06:30 - Breakfast
07:30 - Exercise
09:00 - 3 hours meditation
12:00 - Lunch
13:00 - 3 hours meditation
16:00 - Writing period
18:00 - Evening meal
19:00 - 1 hour meditation
21:00 - Sleep

It is worth noting that this schedule generally persists across weekends and contains flexibility for longer or shorter writing periods. It is also worth noting that this is a sample schedule for the beginning of the study. As the study progresses, it is expected that the duration of sleep will lessen.

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