Research Report

Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners

BY

Nadnapang Phophichit et al.
International Buddhist Studies College
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Research Title:	Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners
Researchers:	Dr. Nadnapang Phophichit, Phramaha Phuen Kittisobhano, Asst. Prof. Dr., Phramaha Anon Anando, Asst. Prof. Dr., Phramaha Duangthip Pariyattidhari, Dr., Dr. Sakchai Sakabucha Assoc. Prof. Dr. Wilasinee Jeungprasopsuk, Dr. Tararat Khaokhiew
Department:	International Buddhist Studies College, Mahachulalongkornrajavidyalaya University
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Abstract

This study investigates the effects of the Four Foundations of Mindfulness-Based Intervention (FFMBI) on various physiological and psychological markers, including salivary cortisol levels, body composition, blood pressure, pulse rate, and brain waves. The research aims to develop and assess FFMBI, a comprehensive mindfulness program grounded in the Four Foundations of Mindfulness practices. A mixed-methods approach was employed, incorporating both qualitative and quantitative research methodologies. In-depth interviews were conducted with 12 key informants including *Vipassanā* meditation masters and Buddhist scholars to develop the FFMBI program. The quantitative component involved an experimental study with 30 volunteer participants who participated in a 7-day meditation retreat. Data were collected before and after the intervention to evaluate physical and mental changes.

The results demonstrated significant reductions in stress levels, with self-reported stress scores decreasing from 32.07 to 23.00 as measured by the Suanprung Stress Test 20 (SPST). Brainwave analysis through EEG revealed significant improvements in the alpha/beta ratio, both in the highest scores (increased from 54.84 to 79.82) and average scores (increased from 6.16 to 9.80), suggesting enhanced mental relaxation. Body composition changed with a slight decrease in body weight and slight improvement in BMI and degree of obesity, but there were no significant changes were observed in heart rate and blood pressure. Contrary to expectations, salivary cortisol levels increased from 0.106 µg/dL to 0.405 µg/dL (p-value < 0.05), indicating a need for further investigation into the physiological responses to FFMBI. Overall, the findings indicate that FFMBI effectively reduces perceived stress and enhances brainwave patterns associated with mental relaxation. This study provides valuable insights into the holistic effects of FFMBI, contributing to the evidence base supporting their implementation in holistic well-being programs. The significant improvements in both psychological and physiological markers underscore the potential of FFMBI as a non-pharmacological intervention for enhancing overall mental and physical well-being.

Acknowledgement

The research work on “Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners” has been successfully completed through dedicated effort and the generous support of numerous individuals and institutions. Without their invaluable assistance, this research would not have been possible, and I hereby express my sincere appreciation and heartfelt gratitude to all who contributed.

I would like to begin by extending my deepest gratitude to Most Venerable Phra Medhivajarapundit, Prof. Dr., Director of the International Buddhist Studies College (IBSC), Mahachulalongkornrajavidyalaya University, for his continuous encouragement and visionary leadership. I am also grateful to the executives and staff of IBSC for their kind support and facilitation throughout the research process.

Special thanks are due to the *Vipassanā* meditation masters and Buddhist scholars, whose profound insights helped shape the core of this study. I am particularly grateful to all key informants and research participants, both Thai and international, whose willingness to share their time and experiences greatly enriched the data collection and validation of the FFMBI intervention.

I would like to express our sincere gratitude and deep respect to Phrakhrubhawana Waralangkara Vi. (Phra Ajahn Somsak Sorado), the abbot of Wat Bhaddanta Asabharam and a revered *Vipassanā* meditation master, for his boundless loving-kindness, compassionate support, and generous permission to conduct the FFMBI intervention and data collection at the monastery. His guidance and facilitation were instrumental to the success of this research.

Deep appreciation is also extended to Phra Maha Thongman Suddhacitto and Phra Ajahn Amnaj Khantiko, Vice Abbot of Wat Bhaddanta Asabharam, for their dedicated teachings and guidance in the Four Foundations of Mindfulness practice during the FFMBI program. Their contributions were invaluable in delivering authentic Dhamma-based instruction to participants.

In addition, I sincerely appreciate Mr. Yutthachai Phukhanthasom for his generous support of the Buddhist academic research fund, which contributed significantly to the successful realization of this project under IBSC.

In closing, I humbly dedicate any merit arising from this research to all those who offered moral, academic, and spiritual support throughout this journey.

Dr. Nadnapang Phophichit
Head of the Research Project
September 2024

Table of Contents

Table of Contents (Cont.)

Table of Contents (Cont.)

Table of Contents (Cont.)

Lists of Tables

Lists of Figures

Lists of Figures (Cont.)

List of Symbols and Abbreviations

The Abbreviations are used in this Research Report for reference:

A. Abbreviations for the Original Texts

D	*Dīgha-nikāya*
Dhp-a	*Dhammapada-aṭṭhakathā*
Khp	*Khuddakapāṭha*
M	*Majjhima-nikāya*
S	*Saṃyutta-nikāya*
Vism	*Visuddhimagga*

B. Scholarly Abbreviations

AI	Artificial Intelligence
B.E	Buddhist Era (appears “before” the date)
C.E	Common Era (appears “after the date)
Ed./(Eds)	Edited by/ Editor(s)
FFMBI	Four Foundations of Mindfulness-Based Intervention
e.g.	exempli gratia/ for example
et al.	et alii or et alia, and others
ibid.	Ibiden/ in the same book or place which has been “cited just before”
loc. cit.	loco citato, in the same cited
p./pp.	Page/pages
Tr./trs.	Translated by/ Translator(s)
Vol.	Volume

Chapter 1

Introduction

1.1 Background and Significance of the Problems

The Four Foundations of Mindfulness (*cattāro satipaṭṭhānā*) refer to the systematic establishment of mindfulness on four primary bases. This principle is expounded in the *Satipaṭṭhāna Sutta* and the *Mahāsatipaṭṭhāna Sutta*, where the Buddha outlines a methodical contemplation of four domains[1]: the contemplation of the body (*kāyānupassanā satipaṭṭhāna*), feelings (*vedanānupassanā satipaṭṭhāna*), mind (*cittānupassanā satipaṭṭhāna*), and mind-objects (*dhammānupassanā satipaṭṭhāna*). The Buddha defines this practice as "the direct path for the purification of beings for the surmounting of sorrow and lamentation, for the disappearance of pain and grief, for the attainment of the true way, for the realization of *Nibbāna*." [2] The Four Foundations of Mindfulness not only reflect the core of Buddhist insight practice but also provides a structured approach to mental training that remains profoundly relevant today.

The Buddha emphasizes the importance of the Four Foundations of Mindfulness, asserting that the cultivation of mindfulness of the body, feelings, mind, and phenomena constitutes the direct path to achieving the ultimate goal of Buddhist practice—the eradication of suffering and the attainment of liberation. The discourse states that, when developed, these foundations progressively lead to insight and awakening. Whoever practices these Four Foundations of Mindfulness for a certain period of time may expect one of two results: either full awakening (*arahantship*) in this very life, or, if some underlying attachment remains, the attainment of the state of

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[1] M I 56-63; D II 290–315.

[2] M I 56; Bhikkhu Ñāṇamoli & Bhikkhu Bodhi (tr.), *The Middle Length Discourses of the Buddha*, (Boston: Wisdom Publications, 1995), p. 145.

a non-returner (*anāgāmī*).[3] The continued relevance of this timeless teaching invites contemporary practitioners to follow the same transformative path that the Buddha himself realized and taught for the benefit of all beings.

Over recent decades, Mindfulness-based interventions have gained significant attention for their potential to improve mental and physical well-being.[4,5,6] However, existing research has primarily focused on general mindfulness programs, with limited studies examining the comprehensive impact of interventions specifically based on the Four Foundations of Mindfulness. This study aims to address this gap by examining the effects of the Four Foundations of Mindfulness-Based Intervention (FFMBI) on a range of physiological and psychological indicators, including salivary cortisol levels, body composition, blood pressure, pulse rate, and brain waves of practitioners.

In response to the growing interest in Mindfulness-based interventions, the purpose of this research is to design and develop the FFMBI by integrating insights from Buddhist scholars and *Vipassanā* meditation masters, in accordance with the core principles of the Four Foundations of Mindfulness practice in the *Satipaṭṭhāna Sutta* of the *Pāli* Canon (*Tipiṭaka*). The FFMBI focuses on four key domains: the cultivation of mindfulness of the body, feelings, mind, and mental objects. These practices include

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[3] D II 314; M I 63; Ibid., p. 155.

[4] Goldberg, S. B., Tucker, R. P., Greene, P. A., Simpson, T. L., Kearney, D. J., & Davidson, R. J., "Is Mindfulness Research Methodology Improving Over Time? A Systematic Review", *PloS One*, Vol. 13, No. 10 (October 2018): e0201448.

[5] Goyal, M., Singh, S., Sibinga, E. M., Gould, N. F., Rowland-Seymour, A., Sharma, R., & Haythornthwaite, J. A., "Meditation Programs for Psychological Stress and Well-Being: A Systematic Review and Meta-Analysis", *JAMA Internal Medicine*, Vol. 174, No. 3 (March 2014): 357–368.

[6] Pascoe, M. C., Thompson, D. R., & Ski, C. F., "Yoga, Mindfulness-Based Stress Reduction and Stress-Related Physiological Measures: A Meta-Analysis", *Psychoneuro-endocrinology*, Vol. 86 (August 2017): 152–168.

the contemplation of phenomena in their true nature[7]—impermanent (*anicca*), unsatisfactory (*dukkha*), and not under our control (*anattā*). As an intervention, FFMBI serves as a gateway to deeper awareness, enabling individuals to observe both internal and external experiences with equanimity and insight. The intervention is implemented with a group of participants to test its hypotheses and evaluate its effects on both physiological markers and psychological outcomes.

Salivary cortisol levels have been widely used as a biomarker to measure stress and the body's physiological response to stressors.[8,9] High levels of cortisol have been associated with various adverse health outcomes, including anxiety, depression, cardiovascular diseases, and impaired immune function. Understanding the effects of FFMBI on salivary cortisol levels can provide insights into its stress-reducing capabilities and potential benefits for overall health.

In addition, body composition—including measures such as body mass index (BMI), body fat percentage, and muscle mass—is crucial for assessing overall health and risk of chronic diseases. Mindfulness practices have been suggested to influence eating behaviors, physical activity, and body awareness, potentially leading to changes in body composition.[10] Investigating these effects will contribute to our understanding of FFMBI's role in supporting healthy living.

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[7] Somdet Phra Buddhaghosacharaya (P.A. Payutto), *Dictionary of Buddhism*, 43rd Edition, (Bangkok: Sahadhammik Printing Company Limited, 2021), p. 183.

[8] Albrecht, S. S., Kamarck, T., Stawski, R. S., Smyth, J. M., & Sciamanna, C. N., "Daily Stressor Reactivity in Relation to Salivary Cortisol: A Systematic Review and Meta-Analysis", *Psychoneuroendocrinology*, Vol. 126 (2021): 105161.

[9] Clow, A., Hucklebridge, F., Stalder, T., Evans, P., & Thorn, L., "The Cortisol Awakening Response: More Than a Measure of HPA Axis Function", *Neuroscience & Biobehavioral Reviews*, Vol. 35 (2017): 97–103.

[10] Ruffault, Alexis, Sébastien Czernichow, and Martin S. Hagger, et al., "The Effects of Mindfulness Training on Weight-Loss and Health-Related Behaviours in Adults with Overweight and Obesity: A Systematic Review and Meta-Analysis," *Obesity Research & Clinical Practice,* Vol. 11, No. 5, Suppl 1 (2017): 90–111.

Blood pressure and pulse rate are also critical measures of cardiovascular health. Chronic stress is known to contribute to elevated blood pressure and increased heart rate, both of which are risk factors for heart disease. Previous research has shown that mindfulness-based interventions can reduce these measures[11], suggesting potential applications of FFMBI as a non-pharmacological strategy for hypertension management and cardiovascular risk reduction.

Furthermore, brainwave patterns measured through electroencephalography (EEG) offer insight into the neurophysiological effects of mindfulness. Specific brainwave frequencies—delta (0.5–4 Hz), theta (4–8 Hz), alpha (8–13 Hz), beta (13–30 Hz), and gamma (30–100 Hz)—correlate with varying states of consciousness, attention, and relaxation. Studies have demonstrated that mindfulness meditation can enhance alpha and theta activity, which are associated with relaxed alertness and meditative states, respectively.[12] Investigating the impact of FFMBI on brain waves can help elucidate the neural mechanisms underlying mindfulness practices and their effects on mental states.

Altogether, understanding the effects of FFMBI on these physiological and psychological parameters holds both theoretical and practical significance. This research contributes to the empirical understanding of mindfulness practices and supports the development of the integrative FFMBI program. Overall, this research aims to bridge gaps in current knowledge, providing valuable insights into the holistic effects of FFMBI on the mind-body connection and overall well-being.

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[11] Babak, A., Motamedi, N., Mousavi, S. Z., & Ghasemi Darestani, N., "Effects of Mindfulness-Based Stress Reduction on Blood Pressure, Mental Health, and Quality of Life in Hypertensive Adult Women: A Randomized Clinical Trial Study," *Journal of Tehran Heart Center*, Vol. 17, No. 3 (2022): 127–133.

[12] Alexander T. Duda, Adam R. Clarke, Robert J. Barry, Frances M. De Blasio, "Mindfulness Meditation is Associated with Global EEG Spectral Changes in Theta, Alpha, and Beta Amplitudes," *International Journal of Psychophysiology*, Vol. 206 (2024): 112465.

This research shows how the Four Foundations of Mindfulness-Based Intervention (FFMBI) as a whole can improve both physical and mental well-being. The findings help develop more effective mindfulness programs grounded in the timeless teachings of the Buddha on the Four Foundations of Mindfulness, evidence-based interventions that enhance physiological and psychological well-being. They also support the use of FFMBI as a practical, non-pharmacological approach for promoting holistic well-being, benefiting both individuals and the broader society.

1.2 Statement of the Problems Desired to Know

1.2.1 What are the appropriate duration, daily structure, supporting activities, and key Dhamma principles for a Four Foundations of Mindfulness-Based Intervention (FFMBI), based on insights from Buddhist scholars and *Vipassanā* meditation masters, in accordance with the concepts of the Four Foundations of Mindfulness practice in the *Satipaṭṭhāna Sutta*?

1.2.2 What changes occur in practitioners' salivary cortisol, body composition, blood pressure, pulse rate, and brain-wave activity after completing the FFMBI?

1.2.3 What are practitioners' subjective experiences and perceptions after receiving the FFMBI intervention?

1.3 Objectives of the Research

1.3.1 To develop a Four Foundations of Mindfulness-Based Intervention (FFMBI) by integrating insights from Buddhist scholars and *Vipassanā* meditation masters, in accordance with the concepts of the Four Foundations of Mindfulness practice in the *Satipaṭṭhāna Sutta*.

1.3.2 To implement the FFMBI in a controlled setting with a cohort of experienced practitioners, assessing the feasibility, adherence, and practical application of the intervention.

1.3.3 To evaluate the effects of FFMBI on key physiological markers (salivary cortisol levels, body composition, blood pressure, and pulse rate) and

neurophysiological parameters (brainwave activity), alongside psychological outcomes (self-reported stress levels).

1.4 Scope of the Research

This study adopts a mixed-methods design, organized into two sequential phases–development (qualitative) and implementation & evaluation (quantitative + qualitative)–to fulfill the three research objectives.

1.4.1 Scope of Sources of Data

1.4.1.1 Phase 1: Development of FFMBI (Qualitative Data)

Literature Review: Phase 1 focuses on the qualitative development of the Four Foundations of Mindfulness-Based Intervention (FFMBI). A comprehensive literature review is conducted, examining English translations of the *Tipiṭaka*, commentaries, contemporary research articles, and Buddhist journals related to the Four Foundations of Mindfulness.

In-depth interviews: To complement the textual study, twelve in-depth, semi-structured interviews are carried out with experts in the field, including six senior Buddhist scholars and six experienced *Vipassanā* masters. These interviews aim to gather expert guidance on key elements necessary for the program's design, such as the optimal duration of the intervention, the daily practice structure (including sitting meditation, walking meditation, and mindful posture training), supplementary activities like Dhamma talks and meditation interviews, and the identification of Dhamma principles that either support or obstruct mindfulness practice. This integration of textual analysis and expert insight serves as the foundation for developing a program that is both authentic to the *Satipaṭṭhāna Sutta* and practically suits for contemporary practitioners.

1.4.1.2 Phase 2: Implementation, Experiment, and Evaluation (Quanti-tative & Qualitative Data)

Pre- and Post-Intervention Measures: Phase 2 involves both quantitative and qualitative methods to implement and evaluate the Four Foundations of Mindfulness-Based Intervention (FFMBI). Pre- and post-intervention measures for

data collection are conducted in collaboration with the Holistic Health and Medical Diagnostic Center, Faculty of Medical Technology, Mahidol University (MUMT). The center's expertise in holistic health and medical diagnostics make it an ideal partner for ensuring standardized and reliable data collection procedures. Quantitative data collection includes salivary cortisol levels assessed using the Elecsys immunoassay, body composition parameters (BMI, fat mass, lean mass, bone mass, and water content) measured with the Tanita DC360 bioimpedance analyzer, and cardiovascular metrics such as systolic and diastolic blood pressure and heart rate using the TM-2657P blood pressure monitor. EEG brain-wave activity is recorded using The SeMind EEG system of the Faculty of Medical Technology, focusing on alpha/beta and theta/delta wave ratios. Psychological outcomes are evaluated through self-reported stress levels using the Suanprung Stress Test-20 questionnaire.

Post-intervention Interviews: To complement the quantitative findings, semi-structured post-intervention interviews are conducted with the participants, aiming to capture subjective experiences, perceived benefits, and the integration of mindfulness practices into daily life. This mixed-methods approach provided a comprehensive understanding of the intervention's physiological and psychological effects.

1.4.2 Scope of Content

The scope of this study encompasses both the design and the evaluation of the Four Foundations of Mindfulness-Based Intervention (FFMBI) program. Phase 1 focuses on program development, while Phase 2 addresses systematic evaluation. The design process integrates primary and secondary sources of Buddhist literatures, in-depth interviews, to build an authentic and effective retreat-based intervention. The evaluation phase ensures that both physiological and psychological outcomes are systematically assessed in order to evaluate the program's effect on participants.

Program Design Content: The Four Foundations of Mindfulness-Based Intervention (FFMBI) program is developed by incorporating daily practice sessions that include sitting meditation, walking meditation, posture training, mindful eating, contemplation of minor daily activities, meditation interviews, and thematic Dhamma

talks. Each component is carefully structured to progressively cultivate mindfulness in alignment with the Four Foundations of Mindfulness, as expounded in the *Satipaṭṭhāna Sutta* and the *Mahāsatipaṭṭhāna Sutta*. In these canonical texts, the Buddha outlines a systematic contemplation of four domains: (1) contemplation of the body (*kāyānupassanā*), (2) contemplation of feelings (*vedanānupassanā*), (3) contemplation of the mind (*cittānupassanā*), and (4) contemplation of mental objects or phenomena (d*hammānupassanā*). Within the FFMBI program, these domains are integrated through specific practices and thematic reflections, ensuring that participants systematically cultivate mindfulness in accordance with authentic Buddhist teachings.

Implementation Content: The FFMBI program is implemented with a group of practitioners who meet the research inclusion criteria. The intervention is conducted under controlled environmental and temporal conditions at Wat Bhaddanta Arsabharam, Chonburi, Thailand, a meditation retreat center providing an appropriate setting for mindfulness training and meditation practices.

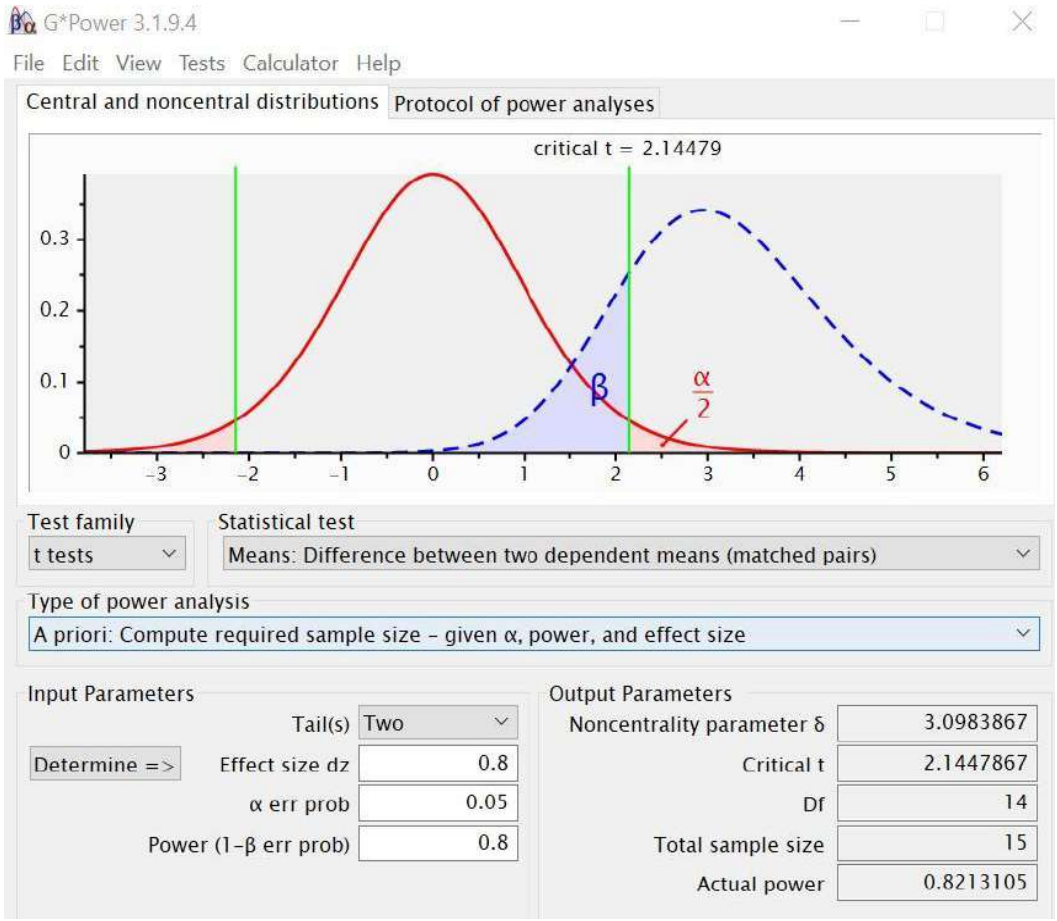
Evaluation Content: Standardized protocols for all physiological and psychological measurements are employed, including assessments of salivary cortisol levels, body composition, blood pressure, pulse rate, brain wave activity, and self-reported stress levels. Data collection is conducted in collaboration with the Holistic Health and Medical Diagnostic Center, Faculty of Medical Technology, Mahidol University (MUMT). Additionally, semi-structured interview guides are developed to capture post-intervention reflections, carefully mapped to emergent themes identified in Phase 1. This ensures consistency between the program's developmental insights and participants' reported experiences.

1.4.3 Scope of Population

The study sample comprises participants who meet the inclusion criteria. The minimum sample size for paired sample t-test analysis is calculated using G*Power software version 3.1.9.4, assuming an estimated effect size of 0.8, an α value of 0.05,

and a power of 80%.[13] The minimum sample size calculated is 15, which is increased to 30 to accommodate incomplete tests.

Figure 1.1 G*Power software version 3.1.9.4



The data collected in this study undergo rigorous statistical analysis, utilizing various measures of central tendency, including descriptive statistics such as percentages, means, and standard deviations. To examine significant differences in the One-group Pretest-Posttest Design, a t-test analysis is employed as the primary statistical tool.

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[13] Cohen, J., "The Effect Size Index: d.", *Statistical Power Analysis for the Behavioral Sciences*, Vol. 2 (1988): 284–288.

1.4.4 Scope of Area

The research is conducted at Wat Bhaddanta Asabharam, located at 118/1 Moo 1, Ban Nong Pru, Tambon Nong Phai Kaeo, Amphoe Ban Bueng, Chonburi Province, Thailand. This temple provides a suitable setting for the study, offering the necessary facilities and resources for mindfulness training and meditation. The meditation retreat center offers a focused, intensive environment conducive to mindfulness practice, making it a suitable location for implementing the Four Foundations of Mindfulness-Based Intervention (FFMBI).

1.4.5 Scope of Time

This research spans a one-year period, from October 2023 to September 2024, under contract number W.113/2567. The study is divided into two main phases:

1.4.5.1 Phase 1: Development of FFMBI (Qualitative Data)

The development of the Four Foundations of Mindfulness-Based Intervention (FFMBI) takes place from October 2023 to May 2024. During this phase, in-depth interviews with key informants will be conducted, and the FFMBI will be designed based on insights gathered from Buddhist scholars and *Vipassanā* meditation masters.

1.4.5.2 Phase 2: FFMBI Implementation, Experimentation, and Evaluation (Quantitative & Qualitative Data)

The implementation of the FFMBI, including the experiment and evaluation, takes place from June 2024 to September 2024. Data collection during this phase involves both quantitative and qualitative methods, including the collection of physiological measures (e.g., salivary cortisol levels, brain waves, body composition, blood pressure, and pulse rate) and psychological measures (e.g., pre- and post-intervention assessments). Additionally, post-intervention interviews are conducted to gather further insights into participants' experiences and the effectiveness of the FFMBI program.

1.5 Research Hypothesis

Based on the existing literature and the objectives of this study, the following research hypotheses are proposed:

1.5.1 The Four Foundations of Mindfulness-Based Intervention (FFMBI) will result in a significant decrease in salivary cortisol levels and a significant reduction in stress among practitioners after receiving the intervention compared to their baseline levels.

1.5.2 FFMBI will lead to a significant improvement in brain wave patterns associated with relaxation (e.g., increased alpha wave activity) among practitioners after receiving the intervention compared to their pre-intervention measurements.

1.5.3 FFMBI will result in a significant improvement in body composition, indicated by reduced body fat percentage and increased muscle mass, among practitioners after receiving the intervention compared to their initial measurements.

1.5.4 FFMBI will lead to a significant decrease in blood pressure and pulse rate among practitioners after receiving the intervention compared to their pre-intervention measurements, indicating improved cardiovascular health and relaxation.

These hypotheses predict that FFMBI will have a positive impact on multiple physiological and psychological parameters, including salivary cortisol levels, brain wave patterns, body composition, blood pressure, and pulse rate. The intervention is expected to result in decreased stress levels, improved relaxation, positive changes in body composition, and enhanced cardiovascular health among practitioners.

1.6 Definition of the Terms Used in the Research

In order to provide clarity and precision in the context of this study, a set of key terms and concepts are defined. This research, titled “Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners,” utilizes specific terminology to describe the framework and variables involved. The following definitions aim to ensure that readers have a clear understanding of the core elements of this study, which integrates mindfulness practices within a structured

intervention aimed at evaluating the effects on various physiological and psychological parameters.

Four Foundations of Mindfulness refer to the core principles of *Vipassanā* meditation as expounded in the *Satipaṭṭhāna Sutta* and the *Mahāsatipaṭṭhāna Sutta*, where the Buddha outlined the methodical cultivation of these four domains. These foundations form the basis of mindfulness practice and are systematically cultivated through contemplation in four domains: (1) mindfulness of the body (*kāyānupassanā*), (2) mindfulness of feelings (*vedanānupassanā*), (3) mindfulness of the mind (cittānupassanā), and (4) mindfulness of mental objects or phenomena (dhammānupassanā). These practices are integral to developing insight and awareness, ultimately leading to liberation from suffering.

Mindfulness-Based Intervention (MBI) A structured program designed to incorporate mindfulness practices aimed at promoting physiological and psychological well-being, stress reduction, and enhanced self-awareness. Such interventions commonly involve practices such as meditation, breathing exercises, and body scans, which foster present-moment awareness and non-judgmental observation of thoughts, feelings, and physical sensations.

Four Foundations of Mindfulness-Based Intervention (FFMBI) This intervention, developed specifically for this study, integrates the principles of *Vipassanā* meditation based on the Four Foundations of Mindfulness as outlined in the *Satipaṭṭhāna Sutta* and *Mahāsatipaṭṭhāna Sutta*. FFMBI includes a structured approach to cultivating mindfulness through practices that focus on the four domains: body, feelings, mind, and phenomena. The intervention is designed and implemented to assess its effects on physiological and psychological markers, including salivary cortisol levels, body composition, blood pressure, pulse rate, brain wave activity, and self-reported stress levels.

Salivary Cortisol Levels refer to the measurement of cortisol, a hormone produced by the adrenal glands, in saliva samples. Cortisol is commonly known as the "stress hormone" and plays a crucial role in regulating various physiological processes, including the body's response to stress, inflammation, blood sugar levels, metabolism,

and blood pressure. Salivary cortisol levels provide insights into the individual's stress response and overall physiological well-being.

Body Composition refers to the proportionate distribution of different components in the body, such as body fat, muscle mass, protein mass, water content, bone density, and other tissues. It provides an understanding of the body's overall health and composition beyond simple weight measurements.

Blood Pressure refers to the force exerted by circulating blood against the walls of blood vessels. It is measured in millimeters of mercury (mmHg) and consists of two values: systolic blood pressure (the pressure during heartbeats) and diastolic blood pressure (the pressure between heartbeats). Blood pressure is an essential indicator of cardiovascular health and can help identify conditions such as hypertension (high blood pressure) or hypotension (low blood pressure).

Pulse rate, also known as heart rate, refers to the number of times the heart beats per minute. It is determined by the electrical signals generated by the heart's electrical system. Pulse rate can be measured by palpating peripheral arteries (such as the radial artery) or using devices such as pulse oximeters. Monitoring pulse rate provides information about heart function, cardiovascular fitness, and overall physiological activity.

Brain waves are electrical patterns of activity produced by the brain. They can be detected and measured using techniques such as electroencephalography (EEG). Different types of brain waves, such as alpha, beta, theta, and delta waves, correspond to different states of consciousness, attention, and relaxation. Brain wave measurements provide insights into the electrical activity and functional states of the brain, including the level of mental relaxation and focus.

Practitioners refer to the thirty participants who are recruited based on specific inclusion criteria. These participants voluntarily consent to participate in the study, are of Thai nationality, and have prior experience practicing mindfulness according to the Four Foundations of Mindfulness. They are at least 20 years old and capable of committing to the full experimental duration of FFMBI program. Additionally, participants are able to engage in Walking and Sitting Meditation for a

minimum of 30 minutes per session, maintain good health with no chronic illnesses or mental health issues, and have not experienced a significant loss of a family member within the past six months.

1.7 Advantages Expected to Obtain from the Research

The research on the effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) holds significant potential in providing valuable advantages to the field of mindfulness-based interventions and the well-being of practitioners. By employing a mixed-methods research approach and examining salivary cortisol levels, body composition, blood pressure, pulse rate, and brain waves, this study aims to offer several advantages. Firstly, it strives to scientifically validate the efficacy of FFMBI, contributing to the evidence base supporting its effectiveness.

Secondly, the research provides a holistic understanding of the intervention's impact on multiple physiological and psychological variables, offering a comprehensive perspective on its benefits. Additionally, the study can inform the development and refinement of mindfulness-based interventions, potentially enhancing their practical applications in healthcare settings and stress management programs. Furthermore, the findings contribute to the existing knowledge base in the field of mindfulness-based interventions and promote the integration of the Four Foundations of mindfulness practices for improved well-being. The advantages expected from the research are as follows:

1.10.1 Scientific Validation: The research study on the effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) is expected to provide scientific validation of the efficacy of this intervention. By utilizing a mixed-methods approach and conducting rigorous data analysis, the research findings can contribute to the evidence base supporting the effectiveness of FFMBI in influencing salivary cortisol levels, body composition, blood pressure, pulse rate, and brain waves.

1.10.2 Holistic Understanding: The research aims to investigate the effects of FFMBI on multiple physiological and psychological variables. By examining salivary cortisol levels, body composition, blood pressure, pulse rate, and brain waves, the study provides a holistic understanding of the impact of mindfulness-based interventions on

practitioners. This comprehensive approach allows for a deeper insight into the potential benefits of FFMBI.

1.10.3 Enhanced Well-being: The research outcomes can provide valuable insights into the effects of FFMBI on practitioners' well-being. By examining salivary cortisol levels, a marker of stress response, the study can assess the intervention's potential to reduce stress and promote relaxation. Additionally, analyzing body composition, blood pressure, pulse rate, and brain waves can reveal changes related to physical and mental health, indicating potential improvements in overall well-being.

1.10.4 Informing Mindfulness-Based Interventions: The research findings can inform the development and refinement of mindfulness-based interventions, specifically those based on the Four Foundations of Mindfulness. By identifying the effects of FFMBI on various physiological and psychological variables, the study can provide guidance for optimizing intervention protocols and tailoring them to specific populations or contexts.

1.10.5 Practical Applications: The practical implications of the research are significant. The findings can be used to support the integration of mindfulness-based interventions, such as FFMBI, into healthcare settings, wellness programs, and stress management initiatives. The demonstrated benefits on salivary cortisol levels, body composition, blood pressure, pulse rate, and brain waves can encourage the adoption of mindfulness practices in promoting physical and mental health.

1.10.6 Contribution to Knowledge: The research contributes to the existing body of knowledge in the field of mindfulness-based interventions. By utilizing a mixed-methods approach and combining quantitative and qualitative data, the study enhances the understanding of the effects of FFMBI. The research outcomes can add to the scientific literature and guide future studies investigating the potential applications of mindfulness practice

Chapter 2

Related Concepts, Theories, and Research Works

To achieve the research objectives, relevant documents, concepts, theories concerning Four Foundations of Mindfulness, Mindfulness-Based Intervention, Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves textbooks, research works, and journals are investigated. The review of related literatures is listed as follows:

2.1 Four Foundations of Mindfulness

The Four Foundations of Mindfulness refer to the systematic establishment of mindfulness on four primary bases. This principle is expounded in the *Satipaṭṭhāna Sutta* and the *Mahāsatipaṭṭhāna Sutta*, where the Buddha outlines a methodical contemplation of four domains[1]: (1) contemplation of the body (*kāyānupassanā*), (2) contemplation of feelings (*vedanānupassanā*), (3) contemplation of the mind (*cittānupassanā*), and (4) contemplation of mental objects or phenomena (*dhammānupassanā*). In *Theravāda* Buddhism, these four foundations are regarded as the direct path to insight and liberation. They constitute the essence of Right Mindfulness (*sammā-sati*) in the Noble Eightfold Path and are included among the thirty-seven factors conducive to enlightenment (*bodhipakkhiya-dhammā*). This section presents a literature review of the Four Foundations of Mindfulness, drawing upon primary sources from the *Pāli* Canon and traditional commentaries, and subsequently examines their methods, purposes, outcomes, and benefits of the practice.

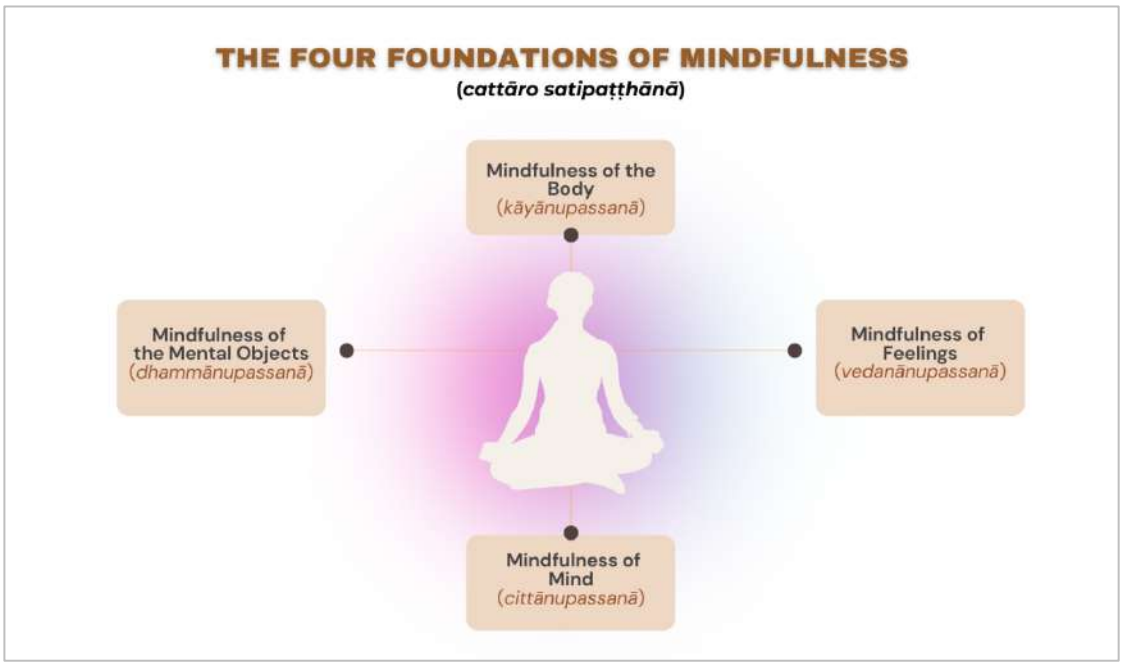
2.1.1 Definition

The Four Foundations of Mindfulness (*Pāli: cattāro satipaṭṭhānā*) constitute a Buddhist teaching on mindfulness practice in *Theravāda* Buddhism. According to the commentarial tradition, the term *satipaṭṭhāna* is etymologically derived from *sati* (mindfulness) and *upaṭṭhāna* (establishment or presence). It is commonly translated as "foundation of mindfulness" or "establishment of mindfulness," referring to the primary domains upon which mindfulness is cultivated. These four domains are: (1) the body (*kāya*), (2) feelings or sensations (*vedanā*), (3) the mind or consciousness (*citta*), and (4) mental objects or phenomena (*dhammā*). Mindfulness (*sati*) is developed and sustained through contemplation of these domains, forming the basis for insight and the progressive development of meditative awareness. This framework is thus referred to

[1] M I 56-63; D II 290–315.

as the "Four Foundations of Mindfulness." [2] In the *Satipaṭṭhāna Sutta*, the Buddha defines this practice as "the direct path for the purification of beings for the surmounting of sorrow and lamentation, for the disappearance of pain and grief, for the attainment of the true way, for the realization of *Nibbāna*." [3]

Figure 2.1 The Four Foundations of Mindfulness



Source: Figure designed by Nadnapang Phophichit, Ph.D.

In conclusion, the Four Foundations of Mindfulness are defined as the establishment of mindfulness on the body, feelings, mind, and mental objects. This practice serves as a direct path to insight, mental purification, and ultimate liberation or Nibbana.

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[2] MA I 238; Vism 678; Bhikkhu Ñāṇamoli (tr.), *The Path of Purification (Visuddhimagga)*, 4th Edition, (Kandy: BPS, 2010), p. 708.

[3] M I 56; Bhikkhu Ñāṇamoli & Bhikkhu Bodhi (tr.), *The Middle Length Discourses of the Buddha*, (Boston: Wisdom Publications, 1995), p. 145.

2.1.2 Significance

The Four Foundations of Mindfulness (*cattāro satipaṭṭhāna*) are considered the core practice leading to liberation. These four mindfulness of the body (*kāya*), feelings (*vedanā*), mind (*citta*), and mental objects (*dhammā*) are taught systematically in two key discourses of the *Pāli* Canon: The *Mahāsatipaṭṭhāna Sutta* of the *Dīgha Nikāya* (DN 22), the collection of the Buddha's Long Discourses and the *Satipaṭṭhāna Sutta* of the *Majjhima Nikāya* (MN 10), the Middle Length Discourses of the Buddha. These discourses present mindfulness not just as a meditation practice, but as the direct path to enlightenment. In the *Mahāsatipaṭṭhāna Sutta*, the Buddha emphasizes the supreme importance of this practice:

"The one and only path, Bhikkhus leading to the purification of beings, to passing far beyond grief and lamentation, to the dying-out of ill and misery, to the attainment of right method, to the realization of Nirvana, is that of the Fourfold Setting up of Mindfulness." [4]

This verse strongly asserts that the practice of the Four Foundations of Mindfulness is the only path (*ekāyano maggo*) to the realization of *Nibbāna*, which is the ultimate goal of Buddhism. Similarly, in the *Satipaṭṭhāna Sutta* of the *Majjhima Nikāya*, the Buddha expounds a concise yet comprehensive version of this same path, offering practical guidance for the cultivation of mindfulness:

"He abides contemplating the body as a body … feelings as feelings… mind as mind…mental objects as mental objects, ardent, fully aware, and mindful, having put away covetousness and grief for the world. …He abides contemplating the body as a body … feelings as feelings… mind as mind…mental objects as mental objects internally, externally, and both internally and externally… to the extent necessary for

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[4] D II 290; T.W. & C.A.F. Rhys Davids (tr.), *Dialogues of the Buddha, Vol. III*, (London: Oxford University Press, 1910), p. 327.

bare knowledge and mindfulness. And he abides independent, not clinging to anything in the world." [5]

Further strengthening its importance, the Buddha assures in both discourses that consistent and diligent practice of the Four Foundations of Mindfulness leads to direct realization:

"Bhikkhus, if anyone should develop these four foundations of mindfulness for seven years… seven months…seven days, one of two fruits could be expected for him: either final knowledge here and now, or if there is a trace of clinging left, non-return." [6]

According to this statement, the Buddha emphasizes the importance of the Four Foundations of Mindfulness, asserting that the cultivation of mindfulness of the body, feelings, mind, and phenomena constitutes the direct path to achieving the ultimate goal of Buddhist practice—the eradication of suffering and the attainment of liberation. The discourse states that, when developed, these foundations progressively lead to insight and awakening. Whoever practices these Four Foundations of Mindfulness for a certain period of time may expect one of two results: either full awakening (*arahantship*) in this very life, or, if some underlying attachment remains, the attainment of the state of a non-returner (*anāgāmī*).

As part of the Noble Eightfold Path, the factor of Right Mindfulness (*sammā-sati*) specifically refers to the practice of the Four Foundations of Mindfulness.[7] In fact, *Theravāda* Buddhism has always held the *Satipaṭṭhāna* teachings in the highest regard. It is widely regarded as one of the most important *suttas* in the *Pāli* Canon for meditation

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[5] M I 56–63; Bhikkhu Ñāṇamoli & Bhikkhu Bodhi (tr.), *The Middle Length Discourses of the Buddha*, p. 145.

[6] D II 314; M I 63; Ibid., p. 155.

[7] D II 313; T.W. & C.A.F. Rhys Davids (tr.), *Dialogues of the Buddha, Vol. III*, p. 344.

training, containing the fullest instructions on the practice of insight (*vipassanā*) meditation. By practicing mindfulness across these four domains, the *Satipaṭṭhāna Sutta* lays out a system of mindfulness cultivation that is the foundation for the realization of all the mind's potentials culminating in final deliverance from suffering. The four foundations of mindfulness are also listed as the first of the thirty-seven factors conducive to enlightenment (*bodhipakkhiya-dhammā*), underlining their role as a basis for all further spiritual development.[8] Through practicing mindfulness in these four domains, a meditator removes the mental hindrances and develops clarity and equanimity, preparing the ground for liberating insight.

In conclusion, the Four Foundations of Mindfulness are rightly considered the heart of Buddhist meditation and the indispensable path leading to the cessation of suffering and the realization of *Nibbāna*. The Buddha's discourses in both the *Mahāsatipaṭṭhāna Sutta* and the *Satipaṭṭhāna Sutta* offer not only profound doctrinal affirmation but also a detailed practical guide. The enduring relevance of this teaching invites all practitioners to walk the same transformative path that the Buddha himself realized and shared for the benefit of all beings.

2.1.3 The Methods of Four Foundations of Mindfulness Practice

The Buddha expounds the method of cultivating these four domains in the *Satipaṭṭhāna Sutta*, as shown in the following passage:

"What are the four? Here, bhikkhus, a bhikkhu abides contemplating the body as a body, ardent, fully aware, and mindful, having put away covetousness and grief for the world. He abides contemplating feelings as feelings, ardent, fully aware, and mindful, having put away covetousness and grief for the world. He abides contemplating mind as mind, ardent, fully aware, and mindful, having put away covetousness and grief for the world. He abides contemplating mind-objects as mind-

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[8] Vism 678; Bhikkhu Ñāṇamoli (tr.), *The Path of Purification (Visuddhimagga)*, 4th Edition, (Kandy: BPS, 2010), p. 707.

objects, ardent, fully aware, and mindful, having put away covetousness and grief for the world."[9]

In other words, the practitioner maintains an attentive observational awareness of each of these four domains as they really are, within themselves, without overlaying notions of self or reacting with attachment or aversion. For example, mindfulness of the body entails observing bodily processes (breathing, postures, activities, anatomical parts, etc.) as "merely body"; mindfulness of feelings means observing feelings (pleasant, unpleasant, neutral) as "merely feelings", and so on, thereby seeing phenomena as they really are rather than as "I" or "mine."

The Four Foundation of Mindfulness practice is an all-round, sustained examination of reality, grounded in mindful awareness of the body and mind processes, leading to clear understanding (*sampajañña*) of their true nature. This contemplation must be undertaken with ardency (*ātāpī*, putting forth effort), clear comprehension (*sampajañña*, fully aware), and mindfulness (*sati*, recollective), having put aside worldly desires and distress.[10] In this way, the four foundations of mindfulness provide a comprehensive definition of right mindfulness in Buddhist practice, encompassing the totality of one's experience – the body (*kāya*), feelings (*vedanā*), mind (*citta*), and mental objects (*dhammā*) – as objects of observation in meditation. The key meditation objects within each foundation are further summarized in Table 2.1, while Figure 2.2 visually presents the core practices associated with each domain of mindfulness.

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[9] M I 56; Bhikkhu Ñāṇamoli & Bhikkhu Bodhi (tr.), *The Middle Length Discourses of the Buddha*, p. 145.

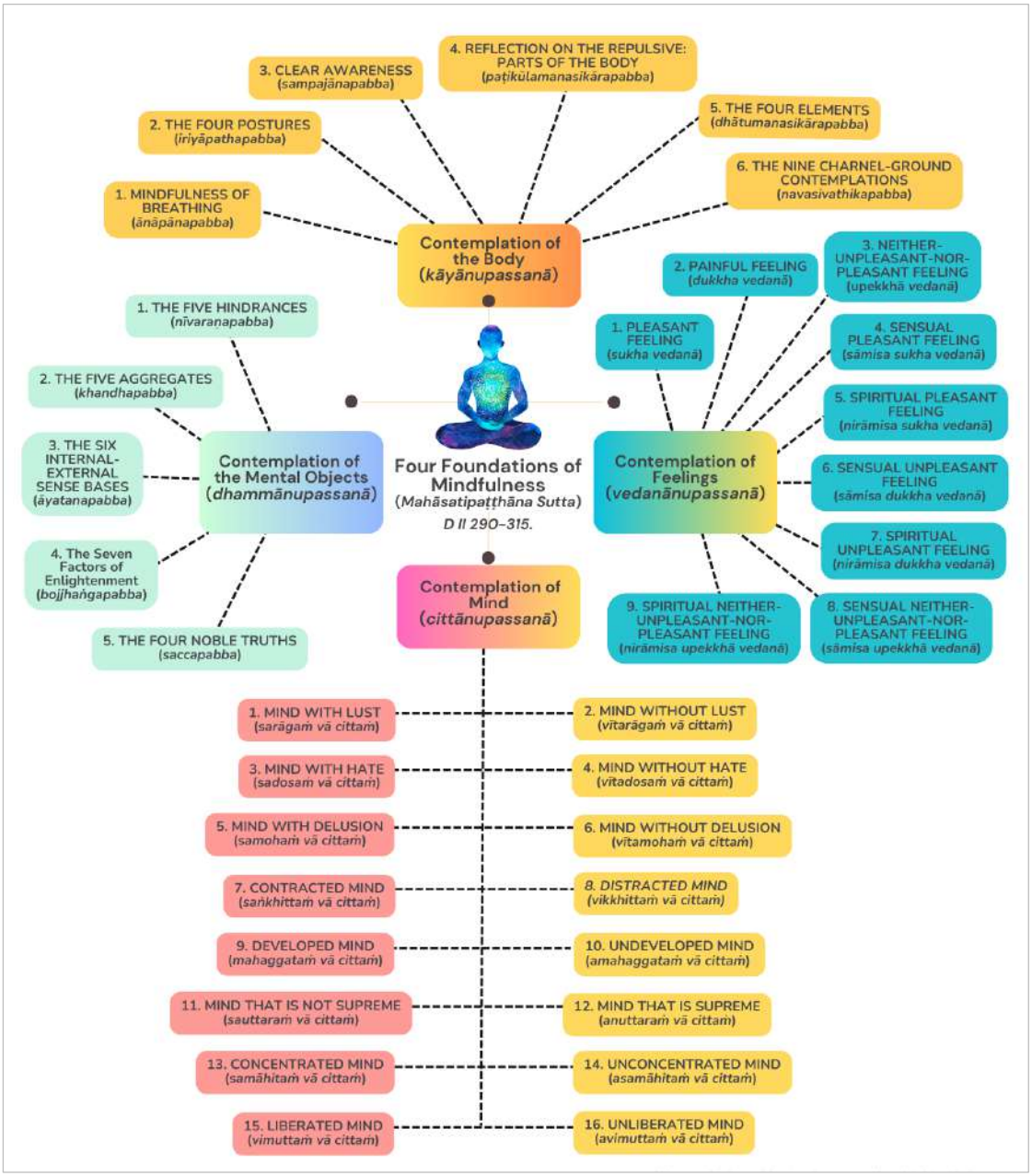
[10] M I 56.

Table 2.1. Primary Objects in each of the Four Foundations of Mindfulness[11]

Foundation	Primary Objects of Mindfulness Practice
Body (*kāya*)	Breath (in-&-out breathing); bodily postures (walking, sitting, etc.); activities with clear comprehension; anatomical parts (e.g. hair, heart, liver, etc.); the four elements (earth, water, fire, wind); corpses in decay (nine charnel-ground contemplations).
Feelings (*vedanā*)	Feeling tones: pleasant, unpleasant (painful), neutral; each further classified as worldly (sensory, physical) or spiritual (non-sensual, mental) feelings.
Mind (*citta*)	States of consciousness: e.g. with lust or free from lust; with hate (anger) or free from hate; with delusion or free from delusion; contracted (sluggish) or distracted; exalted (concentrated, "great") or unexalted; surpassable or unsurpassable (with a higher state possible or not); concentrated or unconcentrated; liberated or not liberated.
Mental Objects (*dhammā*)	Key categories of phenomena: the Five Hindrances (sensual desire, ill will, sloth & torpor, restlessness & worry, doubt) and their removal; the Five Aggregates (form, feeling, etc.) understanding their nature; the Six Internal-External Sense Bases and fetters arising from them; the Seven Factors of Enlightenment development (mindfulness, investigation, etc.); and the Four Noble Truths realization (suffering, its origin, cessation, path).

[11] D II 290-315; Maurice Walshe (tr.), *The Long Discourses of the Buddha.: A Translation of Dīgha Nikāya*, (Boston: Wisdom Publication, 1995), pp. 335–350.

Figure 2.2. Key Practices in Each of The Four Foundations of Mindfulness[12]



Source: Figure designed by Nadnapang Phophichit, Ph.D.

[12] Ibid.

The *Satipaṭṭhāna Sutta* itself is essentially an instruction manual on how to practice mindfulness in each of the four domains. It lays out a variety of meditation methods and exercises under each foundation, illustrating the breadth of this approach. A key feature of these methods is that they are experiential and contemplative, not merely theoretical. The practitioner is directed to observe phenomena directly, in the present moment, and to maintain an investigative awareness of their nature.

1. Contemplation of the Body (*kāyānupassanā*)

The Buddha expounds fourteen methods of practice under the Contemplation of the Body (*kāyānupassanā*) in the *Satipaṭṭhāna Sutta*. These include[13]:

1.1 Mindfulness of breathing (*ānāpānapabba*)

1.2 The four postures (*iriyāpathapabba*)

1.3 Clear awareness (*sampajānapabba*)

1.4 Reflection on the repulsive (*paṭikūlamanasikāra-pabba*)

1.5 The four elements (*dhātumanasikārapabba*)

1.6 The nine charnel-ground contemplations (*navasivathikapabba*)

Among the fourteen methods of contemplating the body (*kāyānupassanā*), the commentary divides them into two categories: eleven methods are considered *Samatha* (concentration) meditation, while three methods are considered *Vipassanā* (insight) meditation. This classification is explained by the commentators in the *Khuddakapāṭha* of the *Khuddaka Nikāya* in the *Suttanta Piṭaka*:

"*Tattha yasmā iriyāpathapabbaṃ catusampajaññapabbaṃ dhātumana-sikārapabbanti imāni tīṇi vipassanāvasena vuttāni"* [14]

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[13] Ibid.

[14] Khp I 3; *Paramatthajotikā I: Commentary on the Khuddakapāṭha, Aṭṭhakathā Book 17, Roman Script Edition (84000.org), p. 29*, on online, https://84000.org/tipitaka/attha pali/ read_rm.php?B=17&A=726 (accessed March 15, 2024).

This can be translated as: “Of these, three methods—namely, the section on the four postures (*iriyāpathapabba*), clear comprehension (*sampajānapabba*), and contemplation of the elements (*dhātumanasikārapabba*)—are taught in the context of *Vipassanā* (insight).” In other words, among the fourteen methods, only three are classified as direct *Vipassanā* practices: The contemplation of the four postures (*iriyāpathapabba*), Clear awareness or clear comprehension (*sampajānapabba*), and Contemplation of the four elements (*dhātumanasikārapabba*)

The remaining eleven methods are primarily *Samatha* meditation practices, which develop concentration first and then serve as a foundation for later development of insight. In contrast, the three aforementioned methods are *Vipassanā* meditation practices aimed at cultivating insight directly, without the prerequisite development of *Samatha*.

In the *Satipaṭṭhāna Sutta*, the Buddha introduces a profound and systematic approach to developing mindfulness and insight through the practice of *kāyānupassanā*, or Contemplation of the Body. This foundational aspect of the Four Foundations of Mindfulness offers fourteen distinct methods to observe and understand the body as it truly is—impermanent (*anicca*), unsatisfactory (*dukkha*), and not under our control (*anattā*). These practices serve as gateways to deeper awareness, helping practitioners cultivate detachment and clarity through direct experience. The fourteen methods include mindfulness of breathing, awareness of bodily postures, clear comprehension in daily activities, contemplation on the repulsiveness of body parts, reflection on the four elements, and the nine charnel ground contemplations. Each method plays a unique role in training the mind and fostering insight, as elaborated on in the following summary.

1.1 Mindfulness of breathing (*ānāpānapabba*): The meditator goes to a quiet place, sits down, and focuses on the breath. One is instructed to know "when breathing in long… when breathing out long; …when breathing in a short breath… breathing out short," and to train oneself by thinking "'I shall breathe out experiencing the whole body… I shall breathe in tranquillizing the bodily formation," and similarly on the out-breath[15]. This exercise uses the natural process of breathing as an object of sustained mindfulness and calm, developing concentration and mindfulness together.

1.2 The Four Postures *(iriyāpathapabba*): The meditator maintains awareness of the basic postures of the body: walking, standing, sitting, or lying down. When walking, he knows 'I am walking'; when standing, he knows 'I am standing'; when sitting, he knows 'I am sitting'; when lying down, he knows 'I am lying down'. This practice brings mindfulness into ordinary physical activities, cultivating a continuous awareness of the body's configuration[16].

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[15] M I 56; Bhikkhu Ñāṇamoli & Bhikkhu Bodhi (tr.), *The Middle Length Discourses of the Buddha*, pp. 146–147.

[16] M I 57.

1.2.1 Standing Contemplation

Figure 2.3 Illustration of Standing Contemplation

(a) Standing with both hands held in front

(b) Standing with both hands held behind the body

**Vipassana Meditation Master: Phra Maha Thongman Suddhacitto*
Source: www.youtube.com/@prathongman1

A. Principle:

Thito vā ṭhitomhīti pajānāti[17]

"When standing, he knows that he is standing."[18]

B. Method of Practice[19]:

Standing meditation practice begin by placing your right foot beside your left, adopting a balanced and stable posture. Position your hands either in front of your body or behind your back—if behind, gently clasp your left hand with your right, as shown in Figure 2.3. Keep your head upright and your gaze lowered, softly focusing on a point on the ground approximately two to three meters ahead. Mentally note the phrase "standing, standing, standing," while maintaining full awareness of your posture and bodily presence. The following are the step-by-step instructions for standing meditation:

1. Stand in an upright position with the neck aligned and the body relaxed. Rest the hands either in front or behind the body, as preferred.

2. Keep the eyes partially open, softly gazing at the ground a short distance ahead (about 2–3 meters).

3. Establish mindfulness of the upright posture and mentally note "standing, standing, standing."

4. While repeating the mental note, maintain clear awareness that the body is indeed standing.

5. Keep your attention grounded in the present moment, specifically on the full experience of the standing posture.

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[17] D II 292.

[18] D II 292; Maurice Walshe (tr.), *The Long Discourses of the Buddha.: A Translation of Dīgha Nikāya*, p. 336.

[19] Phrakhrubhawana Waralangkara, *Handbook of Vipassanā Meditation for Beginners*, 2nd Edition, (Chonburi: Wat Bhaddanta Asabharam, 2017), pp. 30–31.

C. Guidelines on What to Avoid During Standing Meditation:

While practicing standing meditation, maintaining the right physical and mental posture is essential for cultivating mindfulness effectively. Certain common habits or misunderstandings can disrupt concentration or divert awareness away from the present moment. To support a stable and focused practice, the following guidelines highlight key points to avoid during standing meditation.

1. Avoid closing the eyes completely or looking around, as this may invite distraction from the meditative focus.

2. Refrain from tilting the head excessively downward or upward; keep the face directed naturally forward.

3. Do not shift attention to the rising and falling of the abdomen during this practice—this is generally reserved for sitting meditation, unless otherwise instructed.

4. Avoid focusing attention on specific body parts such as the feet, knees, abdomen, chest, head, or hairline. Instead, cultivate a general awareness of the standing posture as a whole.

5. Unlike some traditions that recommend equal time for each posture (sitting, walking, standing), this practice emphasizes a brief period of standing—typically just enough to mentally note "standing" three times with clear awareness.

1.2.2 Walking Meditation

A. Principle:

Gacchanto vā gacchāmīti pajānāti[20]

"When walking, he knows that he is walking."[21]

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[20] D II 292.

[21] D II 292; Maurice Walshe (tr.), *The Long Discourses of the Buddha.: A Translation of Dīgha Nikāya*, p. 336.

B. Method of Practice[22]:

Walking meditation is one of the four primary postures in mindfulness practice, traditionally cultivated to complement sitting meditation and support continuous awareness throughout movement. Unlike casual or recreational walking, walking meditation is a deliberate and mindful activity, practiced to bring balance to the mental faculties (Indriya) and deepen one's insight. Practitioners walk forward and backward along a designated path, maintaining continuous awareness of bodily movement and mental phenomena. The general method includes the following key points:

1. The walking meditation method emphasizes cultivating mindfulness through deliberate and conscious movement. The essential steps include:

2. Direct the gaze approximately 2 to 3 meters ahead to avoid distraction and support stable concentration.

3. Anchor the mind on the movement of the feet, maintaining continuous awareness throughout each step.

4. Ensure consistency between mental noting and physical movement. What is mentally observed should align precisely with bodily action.

5. Pause when necessary: If a clear mental or physical phenomenon arises during walking, stop momentarily to mindfully observe it. Once it diminishes or fades, return to walking with awareness.

6. Walk slowly and naturally without putting pressure on the body. Let your mind remain calm, steady, and continuously aware from step to step.

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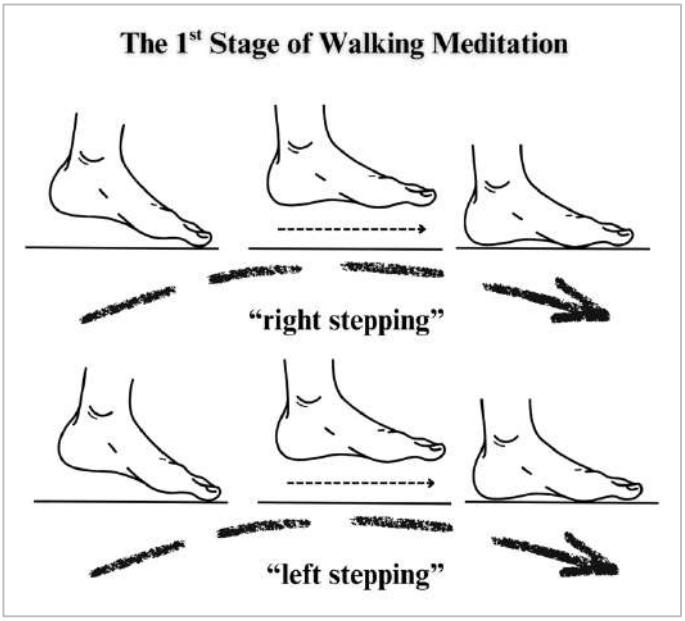
[22] Phrakhrubhawana Waralangkara, *Handbook of Vipassanā Meditation for Beginners*, pp. 30–31.

The Walking Meditation practice is typically developed in six progressive stages, beginning with simple awareness of the feet and gradually increasing in complexity and subtlety of observation.

The 1st Stage of Walking Meditation[23]:

Figure 2.4 Illustration of Walking Meditation Stage 1



Source: Figure designed by Nadnapang Phophichit, Ph.D.

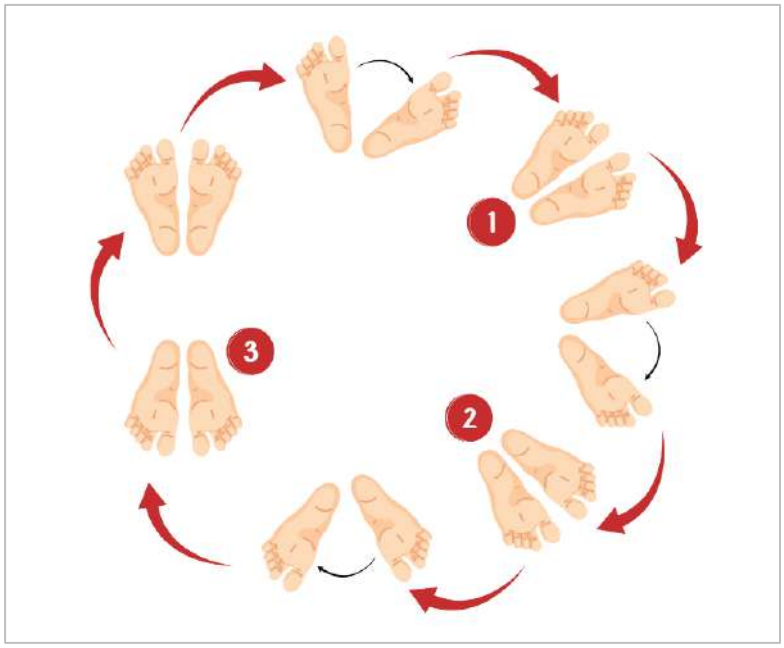
In the first stage, practitioners establish mindfulness by standing still for a few moments to center the mind. First of all, contemplate the state of standing three times, mentally noting "standing, standing, standing." Be clearly aware of the act of standing while in that posture. The body should be upright and relaxed, the hands loosely crossed in front of or behind the body, and the eyes softly gazing about two meters ahead. When ready to begin, attention is directed to the movement of the feet. As the walking begins, the physical movement must be coordinated precisely with the

[23] Venerable Ajahn Tong Sirimangalo (tr. by The Disciples), *The Only Way (Path to Nibbana)*, 6th Edition, (Chiang Mai: Electronic Version, 2004), pp. 49–50.

mental noting: when lifting the right foot, mentally note “right stepping”; when lifting the left foot, note “left stepping.” The mental note must be synchronized exactly with the moment the foot is lifted and moved—not delayed nor anticipated—so that mindfulness remains firmly anchored in the present. The syllable “ing” should coincide with the moment the foot touches the ground. This synchronized practice strengthens continuous awareness and sharpens the clarity of present-moment experience.

Each step should be steady and natural, not too fast or too slow. Avoid forcing the body into unnatural rhythms, which may lead to tension or distraction. The aim is to be fully aware of each step as it happens. During the practice, if any distinct mental or physical phenomenon arises more clearly—such as pain, thoughts, or emotional shifts—the practitioner should momentarily pause walking, observe the experience mindfully until it fades or stabilizes, and then resume walking. Over time, this stage helps develop a calm and relaxed awareness that prepares the meditator for deeper insight into the distinction between physical phenomena (*rūpa*) and mental phenomena (*nāma*), known as *nāmarūpaparicchedañāṇa*.

Figure 2.5 Illustration of Turning (Three Pairs or Six Steps)



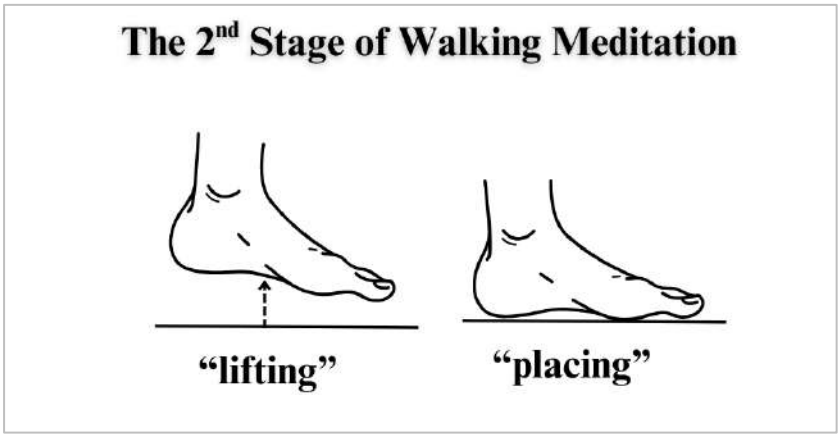
Source: Figure designed by Nadnapang Phophichit, Ph.D.

Turning is an essential component of walking meditation, especially when practicing on a limited path that requires moving back and forth. Upon reaching the end of the walking path, the practitioner should pause and align both feet together, mentally noting “stopping, stopping, stopping.” Once stillness is established, and the posture of standing is clearly perceived, continue with the mental note “standing, standing, standing.” Then, acknowledge the intention to walk again with the noting “intending to walk, intending to walk, intending to walk.” To initiate the turn, the practitioner turns to the right in a sequence of controlled and mindful movements. The turn is typically performed in three pairs of steps (six steps in total), as shown in Figure 2.5, to complete a 180-degree turn and face the opposite direction.

Begin by lifting the right foot and gently stepping it outward to the right at an angle (approximately 60 degrees), mentally noting “turning”, synchronizing the syllable “ing” with the moment the foot touches the ground. Then lift the left foot and place it beside the right foot, again noting “turning,” with “ing” timed to the foot’s contact with the floor. This alternating movement of the right and left foot is repeated until the body has fully turned to face the walking path again. Throughout each step of the turning, maintain mindful awareness by mentally noting “turning” with each foot's motion and “thus” as each foot makes full contact with the floor. After completing the turn, pause again to clearly recognize the standing posture with the mental note “standing” three times. Then, proceed with the next walking cycle at the designated stage of practice, keeping mindfulness anchored to both bodily movement and mental noting. This structured approach to turning helps ensure that mindfulness is sustained throughout the transition, and it also supports the practitioner in maintaining a steady continuity of awareness between walking paths.

The 2nd Stage of Walking Meditation[24]:

Figure 2.6 Illustration of Walking Meditation Stage 2



Source: Figure designed by Nadnapang Phophichit, Ph.D.

In the second stage of walking meditation, the practice deepens by adding more refined awareness to the movement of each step. Begin by standing still with feet parallel, body upright, and head gently aligned. Establish mindfulness by mentally noting "standing, standing, standing." Then, observe the intention to walk by noting "wanting to walk" three times, which represents a conscious moral determination—not driven by craving, but by the aspiration to cultivate mindfulness and detach from the Five Aggregates (*khandha*).

As the intention becomes clear, shift attention to the movement of the foot. While the left foot remains grounded, gently lift the right foot—not higher than ankle level—and mentally note "lifting." Once lifted, move the foot slightly forward and place it down gently, noting "placing" as the sole touches the ground. The noting must end simultaneously with the physical movement, maintaining alignment between mental awareness and bodily action. Repeat the same sequence with the left foot: press the right foot down, lift the left foot while noting "lifting," and place it forward with the

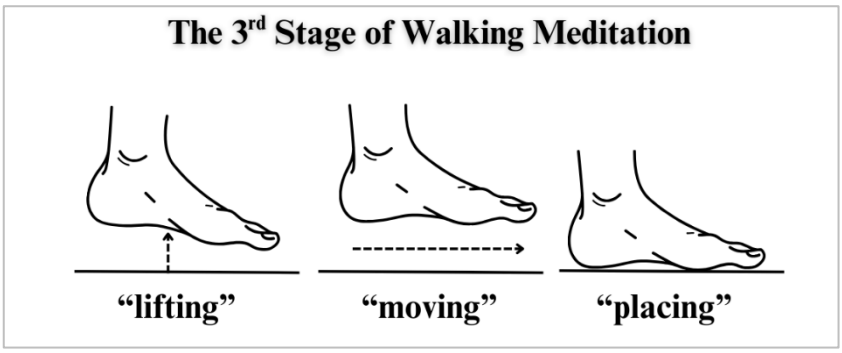
[24] Phrakhrubhawana Waralangkara, *Handbook of Vipassanā Meditation for Beginners*, pp. 40–42.

mental note “placing.” Each step should be taken slowly and naturally, without exaggerating or forcing the motion.

Although there may be a subtle forward motion of the body while placing the foot, this need not be the focus of attention. The key point in this stage is to remain mindful of each “lifting” and “placing” with clarity and precision. At first, this method may feel somewhat awkward or unnatural. However, with consistent practice, the meditator may begin to experience the flow of movement as flexible and calming. The frequent repetition of “lifting” and “placing” offers an opportunity to observe the arising of physical (*rūpa*) and mental (*nāma*) phenomena. This gradually leads to the insight of understanding the conditionality between body and mind (*paccayapariggahañāṇa*), which forms the basis for progressing to the next stage.

The 3rd Stage of Walking Meditation[25]:

Figure 2.7 Illustration of Walking Meditation Stage 3



Source: Figure designed by Nadnapang Phophichit, Ph.D.

In this stage, the walking practice becomes more detailed with focused attention on three main movements of each step. The meditator cultivates mindfulness through clear observation of bodily movement and corresponding mental noting.

[25] Ibid., pp. 43–44.

1. Lifting: Begin by contemplating the state of standing and the intention to walk, mentally noting “standing, standing, standing” three times. Then, as the foot begins to rise, the meditator mentally notes “lifting” in sync with the upward motion. The knee should bend slightly while the heel and the tip of the foot rise together. The foot should not be lifted higher than the ankle level.

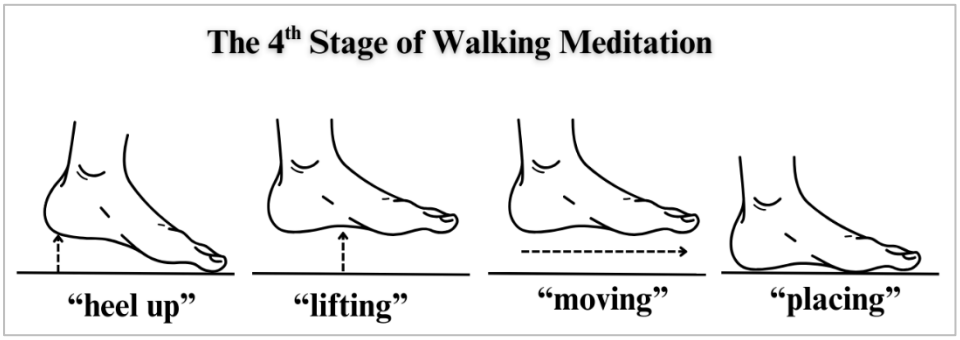
2. Moving: After lifting, the foot is moved forward. During this motion, mentally note “moving.” The stride should be moderate—not too long or too short—to maintain balance and prevent stumbling. Ideally, the distance between the feet should not exceed the length of one foot.

3. Placing: As the foot gently touches the ground and makes full contact, mentally note “placing.” The mental note should coincide exactly with the completion of the placing action, neither before nor after.

Through practicing this stage, the meditator gradually develops insight into the impermanence (anicca) of physical and mental phenomena (rūpa and nāma), their inherent unsatisfactoriness (dukkha), and the truth of non-self (anattā)—that they are not under personal control. This deepened awareness allows the meditator to experience the three universal characteristics through direct observation of movement and mindfulness.

The 4th Stage of Walking Meditation[26]:

Figure 2.8 Illustration of Walking Meditation Stage 4



Source: Figure designed by Nadnapang Phophichit, Ph.D.

In this stage, the practice becomes more refined with increased mindfulness of each component of the step. After mentally noting the state of standing and the intention to walk three times, the meditator begins by focusing on the movement of the foot in four parts:

1. Heel up: As the heel begins to lift from the ground, the meditator notes "raising." The heel should not be lifted higher than the ankle level.

2. Lifting: When the entire foot begins to rise from the floor, including the toes, the meditator notes "lifting." This movement should be done slowly and with full awareness.

3. Moving: As the foot moves forward through the air, the meditator mentally notes "moving," maintaining balance and smooth motion throughout. The step should neither be too long nor too short, keeping a natural and stable distance.

4. Placing: As the foot gently touches down and makes full contact with the ground, the meditator notes "placing." The mental note should end precisely when the foot has been placed completely on the floor—not before or after.

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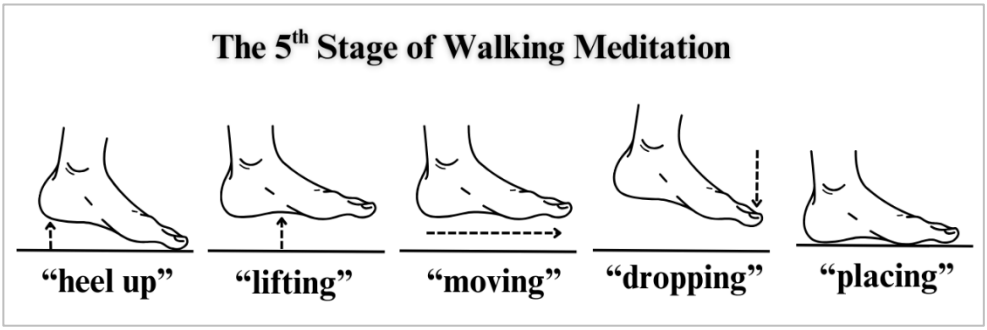
[26] Ibid., p. 46.

This fourth stage helps deepen awareness of bodily movement, and cultivates greater clarity of the dynamic relationship between intention, action, and mindfulness.

The 5th Stage of Walking Meditation[27]:

Figure 2.9 Illustration of Walking Meditation Stage 5



Source: Figure designed by Nadnapang Phophichit, Ph.D.

This stage introduces more refined awareness by dividing the walking process into five distinct movements, each accompanied by a precise mental note. The purpose is to align mindfulness closely with the present-moment experience and to develop deeper concentration and insight.

1. Heel up: Begin by standing still and mentally noting "standing, standing, standing" three times. Then, observe the intention to walk by noting "intending to walk" three times. Shift awareness to the heel of the right foot. As the heel begins to lift from the ground, mentally note "raising"—not before or after the movement, but in synchrony with it.

2. Lifting: As the tip of the foot gradually lifts off the floor, be fully aware of this motion and note "lifting." The movement should be slow and deliberate, with clear attention to the transition of the foot leaving the ground.

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[27] Ibid., pp. 47–48.

3. Moving: While the foot travels forward, keep the mind closely following the movement and mentally note "moving." The step should be smooth and balanced, with no sudden or exaggerated actions.

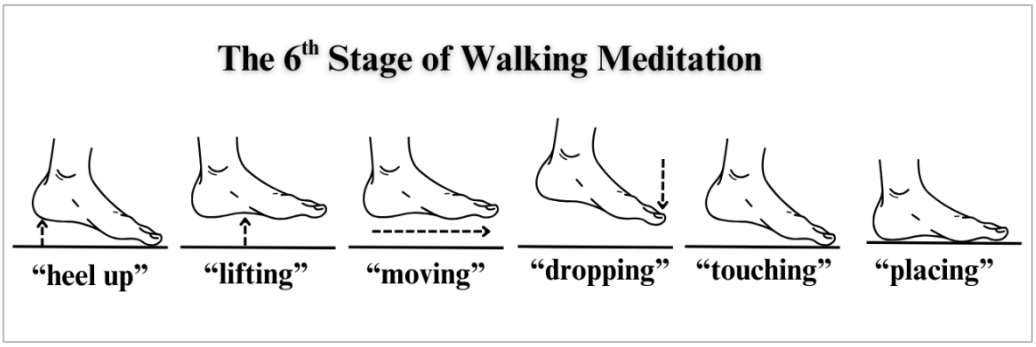
4. Dropping: As the foot begins to lower toward the floor, but before making contact, mentally note "dropping." The foot should be in a parallel position to the ground during this moment.

5. Placing: Finally, when the foot makes contact with the floor—starting with the toes and followed by the heel—note "placing." The mental note must align exactly with the foot's contact with the floor. Avoid noting too early or too late, as this misalignment can weaken mindfulness and disrupt concentration on the present experience.

By carefully following each stage—raising, lifting, moving, dropping, and placing—the meditator refines their awareness of physical and mental processes. This practice strengthens right concentration (*sammāsamādhi*) and supports insight into the impermanence, suffering, and non-self nature of bodily and mental phenomena.

The 6th Stage of Walking Meditation[28]:

Figure 2.10 Illustration of Walking Meditation Stage 6



Source: Figure designed by Nadnapang Phophichit, Ph.D.

[28] Ibid., pp. 49–50.

In this advanced stage of walking meditation, each movement of the foot is observed with greater precision, divided into six distinct phases. Each phase should be noted mentally in alignment with the physical action, promoting continuous mindfulness and deeper insight.

1. Heel up: Begin with mindfulness of standing, noting "standing, standing, standing" three times. Then mentally note "intending to walk" to acknowledge the arising of volition. As the heel begins to rise from the ground, observe this initial movement and mentally note "raising."

2. Lifting: As the tip of the foot starts to lift off the floor, become fully aware of the gradual disconnection from the ground and mentally note "lifting." This movement should be gentle and deliberate, promoting clarity of awareness.

3. Moving: When the foot is in motion, traveling forward, maintain focused attention on the movement and mentally note "moving." The forward step should be balanced and mindful, without haste or heaviness.

4. Dropping: As the foot begins to descend toward the floor—without touching it yet—observe the downward motion and mentally note "dropping." The foot should be parallel to the floor during this phase.

5. Touching: As the toes come into contact with the ground, clearly note the precise moment with "touching." This should coincide exactly with the initial point of contact, cultivating moment-to-moment awareness.

6. Placing: Finally, as the heel gradually lowers and the entire foot is placed fully onto the floor, complete the motion by mentally noting "placing." This marking should be made in unison with the full contact of the foot with the ground. Avoid noting too early or too late, as accurate timing ensures mindfulness remains sharp and grounded in the present.

By dividing the step into these six components, the meditator strengthens their ability to observe subtle bodily movements and mental processes. This fosters deeper insight into the conditional nature of physical and mental phenomena, supporting

the development of wisdom (*paññā*) and concentration (*samādhi*) on the path to liberation.

C. Guidelines on What to Avoid During Walking Meditation:

1. To maintain the quality of mindfulness and avoid common obstacles during walking meditation, practitioners are advised to observe the following:

2. Avoid moving the eyes around or closing them; keep a steady gaze.

3. Do not bend the body forward excessively or raise the face too high.

4. Avoid swinging the arms or stiffening the legs and feet.

5. Refrain from noting things that are not consistent with walking.

6. Do not focus on the abdomen's movement during walking meditation.

7. Maintain a posture that supports natural and relaxed walking.

1.2.3 Sitting Meditation

Sitting meditation is one of the core practices in cultivating mindfulness and insight. To begin, the meditator should choose a sitting posture that is most suitable and comfortable for their body. The key principle is to maintain balance and stillness without strain. There are four commonly practiced sitting meditation postures as shown in Figure 2.11:

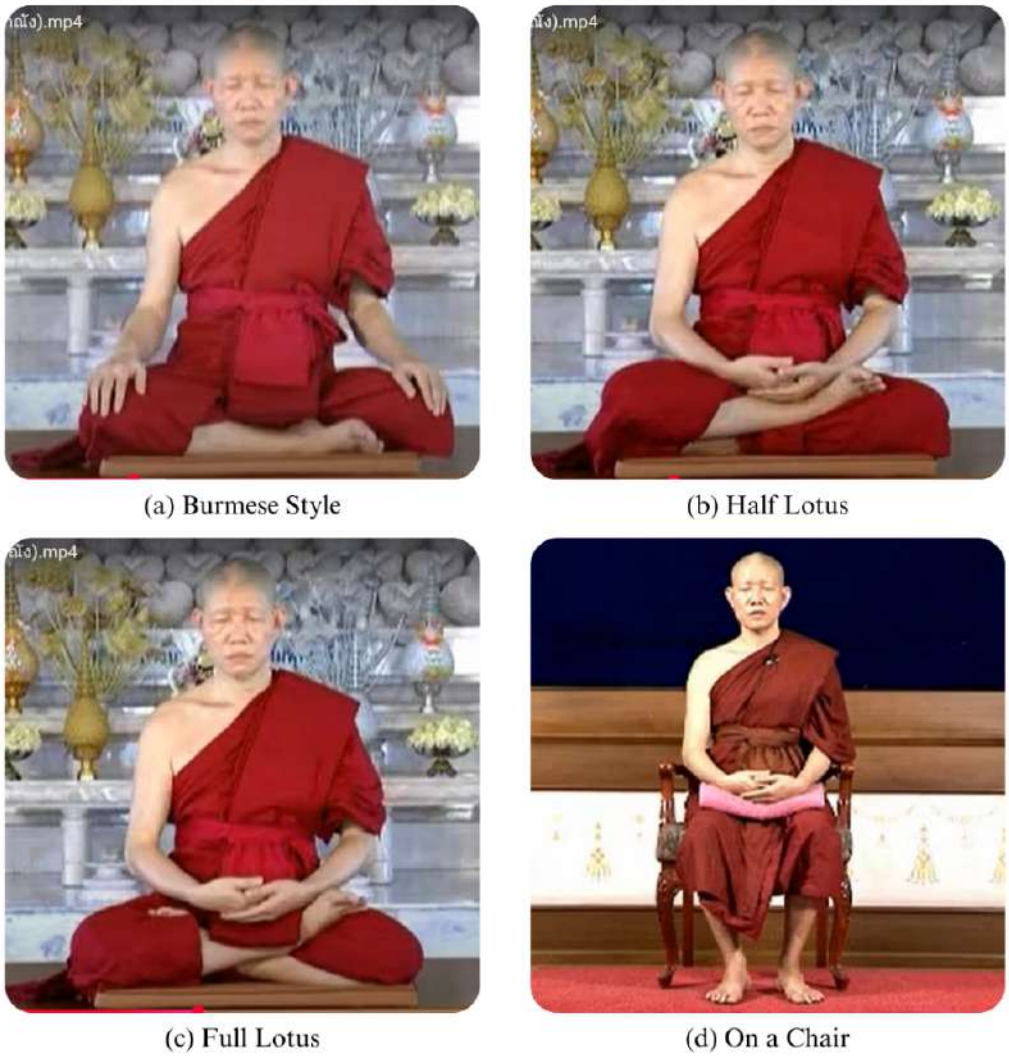
1. Burmese Style (a) – Both legs are bent and laid flat on the floor with one leg slightly in front of the other. The legs do not overlap.

2. Half Lotus Style (b) – One leg is placed on top of the opposite thigh, while the other leg rests beneath.

3. Full Lotus Style (c) – Both legs are crossed with each foot resting on the opposite thigh. This posture offers high stability but requires flexibility.

4. Sitting on a Chair (d) – For those who experience discomfort or physical limitations, sitting on a chair with feet flat on the floor and the back straight is also acceptable.

Figure 2.11 Illustration of Sitting Meditation Postures



(a) Burmese Style (b) Half Lotus

(c) Full Lotus (d) On a Chair

**Vipassana Meditation Master: Phra Maha Thongman Suddhacitto*
Source: www.youtube.com/@prathongman1

A. Principle:

Nisīdati pallaṅkaṁ ābhujitvā, ujuṁ kāyaṁ paṇidhāya, parimukhaṁ satiṁ upaṭṭhapetvā.[29]

"He sits down cross-legged, holding his body erect, having established mindfulness before him."[30]

B. Method of Practice[31]:

Once the posture is selected, the meditator should place the right hand on the left hand with palms facing upward. The thumbs may lightly touch or remain slightly apart. Sit upright—spine straight but not stiff—with the body relaxed. Gently close the eyes, and bring awareness to the present moment. Begin by noticing the movement of the abdomen as the breath flows naturally. Observe the rising and falling sensations of the abdomen as the body breathes in and out. In sitting meditation, various methods of acknowledgment (mental noting) can be applied to develop and sharpen mindfulness. These methods help link the mind directly with bodily sensations, thoughts, or feelings, anchoring awareness in the present experience. Once seated in a chosen posture, the meditator should gently close the eyes, straighten the spine with a relaxed yet upright posture, and align the neck and head without stiffness. Attention should be directed to the natural movement of the abdomen, which serves as the primary object of meditation. The following methods are commonly used:

1. Sitting Meditation Using the Two-Step Acknowledgment Method

This method involves mentally noting two key movements associated with the breath: the rising and falling of the abdomen. As the breath enters and the

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[29] D II 291.

[30] D II 292; Maurice Walshe (tr.), *The Long Discourses of the Buddha.: A Translation of Dīgha Nikāya*, p. 335.

[31] Phrakhrubhawana Waralangkara, *Handbook of Vipassanā Meditation for Beginners*, pp. 51–59.

abdomen expands, the meditator should mentally note “rising.” As the breath leaves and the abdomen contracts, the meditator should note “falling.” It is important that the noting and the physical movement happen simultaneously—neither preceding nor lagging behind the actual sensation. The awareness should encompass the beginning, progression, and ending of each movement. For example, during “rising,” the mind should observe the start of the expansion, its continuation, and the moment it ends. Similarly, for “falling,” the practitioner should stay aware from the start of the contraction through to its conclusion.

Figure 2.12 Illustration of Sitting Meditation Using the Two-Step Acknowledgment Method

**Vipassana Meditation Master: Phra Maha Thongman Suddhacitto*
Source: www.youtube.com/@prathongman1

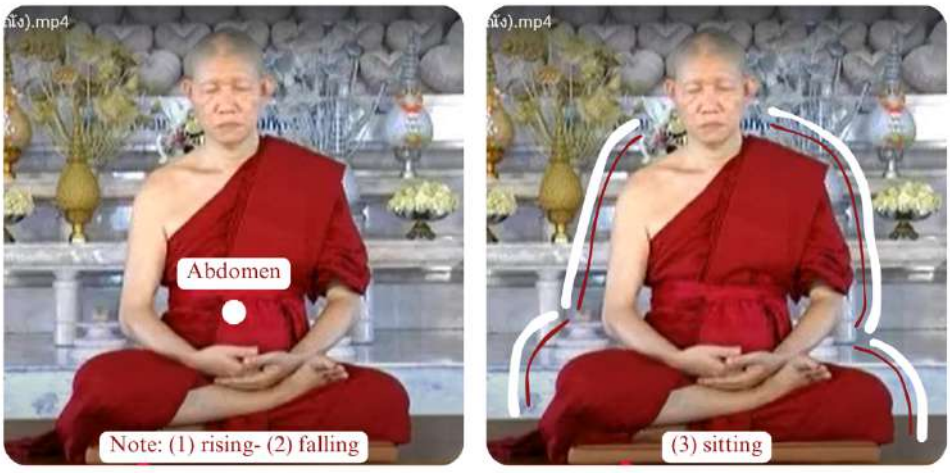
To maintain mindfulness precisely, some practitioners find it helpful to mentally divide the words into syllables such as “rise-sing” and “fall-ling,” uttering the final syllable as the motion concludes. This can assist in keeping awareness aligned with the actual sensation. For beginners, it may be helpful to place both hands on the abdomen to more clearly perceive the abdominal movement. A sitting period of around 15 minutes is recommended initially. If the sensation of rising and falling is not distinct, the meditator may begin by noting more obvious bodily sensations such as “sitting” or “touching,” both of which also follow the two-step acknowledgment principle. With

consistent practice and once mindfulness becomes more stable, the meditator can be guided to move on to the three-step acknowledgment method under the supervision of a qualified meditation teacher.

2. Sitting Meditation Using the Three-Step Acknowledgment Method

Once a meditator has developed sufficient proficiency with the two-step acknowledgment method—clearly and mindfully noting the rising and falling of the abdomen—they may progress to a more refined stage of observation by adding a third noting: "sitting." In this method, the meditator begins by noting the movement of the abdomen during inhalation with the word "rising", and during exhalation with the word "falling." Prior to the next rising movement, the word "sitting" is mentally noted to acknowledge the general posture of the body—awareness of being seated upright with legs crossed (or in whichever posture is being used), and the upper body erect. At this stage, the mental noting sequence is: "rising", "falling", "sitting".

Figure 2.13 Illustration of Sitting Meditation Using the Three-Step Acknowledgment Method



**Vipassana Meditation Master: Phra Maha Thongman Suddhacitto*
Source: www.youtube.com/@prathongman1

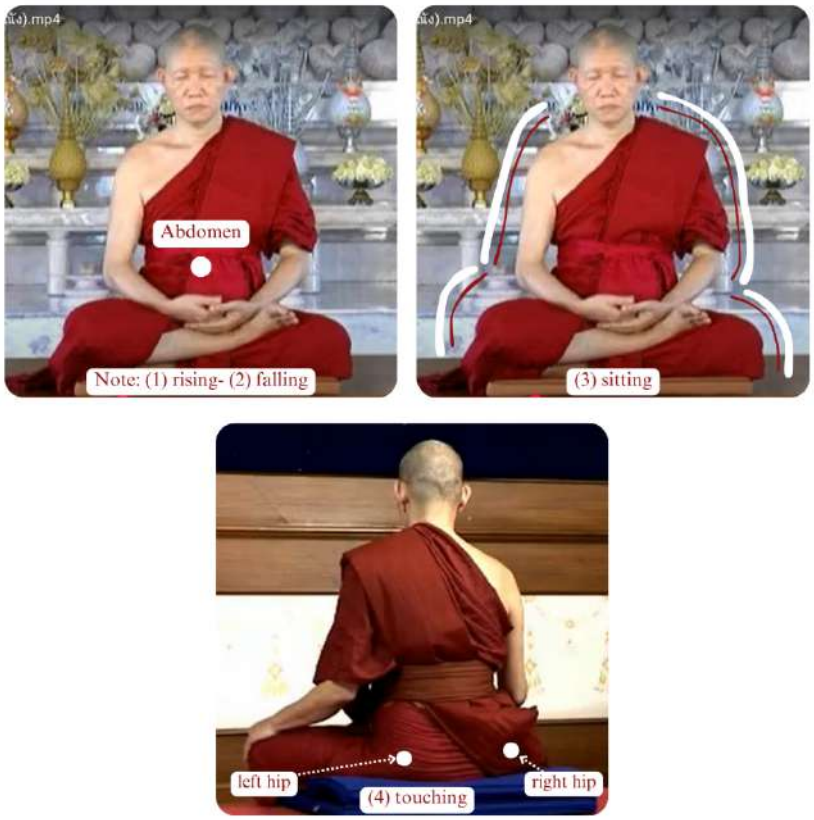
This third noting serves to reinforce awareness of the body's overall posture, particularly between the breaths. However, it is crucial that the word "sitting" is not inserted once the abdomen has already begun to rise, as doing so may interrupt the natural flow of breath and cause discomfort or shallow breathing. Rather, the acknowledgment of "sitting" should be gently inserted in the brief pause between the end of one falling and the beginning of the next rising. This method should only be applied when the meditator's mindfulness is stable enough to observe subtle bodily sensations without interfering with the natural breath. It helps cultivate a more continuous awareness and supports the development of insight into the present-moment experience.

3. Sitting Meditation Using the Four-Step Acknowledgment Method:

In this stage, meditators who have become proficient in the three-step acknowledgment method ("rising, falling, sitting") are encouraged to expand their mindfulness by incorporating a fourth acknowledgment: "touching." This additional step is introduced before the next "rising" occurs. Specifically, as the abdomen completes the "falling" phase, instead of remaining silent as in the third stage, the meditator now brings awareness to a point of contact—typically the right buttock touching the cushion or mat—and mentally notes "touching." It is important at this stage to direct attention to only one point of contact at a time (e.g., the right buttock), as attempting to acknowledge both buttocks simultaneously may lead to confusion or distraction. The sequence of mental noting now follows the pattern: "rising", "falling", "sitting", "touching."

As concentration deepens, the sensation of "touching" may become vivid. Meditators might experience unusual physical sensations in the area of focus—such as warmth, pressure, pricking, or a sense of hardness or protrusion at the point of contact. These sensations are not harmful and tend to disappear once the acknowledgment ceases, indicating that they are mental phenomena, not physical injury.

Figure 2.14 Illustration of Sitting Meditation Using the Four-Step Acknowledgment Method



**Vipassana Meditation Master: Phra Maha Thongman Suddhacitto*
Source: www.youtube.com/@prathongman1

In some cases, more intense states associated with deep concentration and meditative joy (pīti) may arise[32], including:

1. A sense of warmth either in specific areas or throughout the body,
2. Lightness or the feeling of floating,
3. Body stiffness or tension,
4. Tingling or goosebumps,

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[32] Venerable Ajahn Tong Sirimangalo (tr. by The Disciples), *The Only Way (Path to Nibbana)*, p. 56.

5. Swaying or rocking sensations,

6. The feeling of sitting on a raft being gently rocked by waves.

These are common and natural occurrences in meditation practice and are signs of increasing concentration and mindfulness. If these conditions become strong or persistent, the meditation teacher may offer additional guidance on how to proceed appropriately.

C. Guidelines on What to Avoid During Sitting Meditation:

During sitting meditation, maintaining both physical stillness and mental clarity is crucial for the deepening of mindfulness. However, certain actions or habits can interfere with the natural flow of awareness and diminish the effectiveness of the practice. To support sustained concentration and bodily awareness, practitioners should be mindful to avoid the following common distractions and misconceptions.

1. Avoid bending the back or lowering the head unless your body structure naturally requires it.

2. Do not speak aloud, murmur, or vocalize the noting words—keep all acknowledgment internal and silent.

3. Refrain from opening the eyes or allowing external visual distractions to disturb the practice.

4. Limit physical movements to only what is necessary; frequent adjustments can interrupt concentration.

5. Avoid leaning against walls, backrests, or chairs unless taking a short rest due to physical discomfort.

6. Do not use unrelated mantras or words to label the abdominal movement; focus only on the direct experience of “rising” and “falling.”

7. Do not attempt to force or regulate the breath to match the mental noting. The goal is to observe the natural breath and recognize the movement as it occurs.

1.2.4 Lying Meditation

A. Principle

Sayāno vā sayānomhīti pajānāti[33]

"When lying down, he knows that he is lying down."[34]

B. Method of Practice[35]:

Lying meditation is a gentle method for sustaining mindfulness as the body transitions into rest. It supports continued awareness, particularly before sleep, by observing the body and breath with calm attention. The practice involves mentally noting "rising, falling, lying, touching," with the "touching" referring to points of contact between the body and the surface, as in sitting meditation. This practice can be sustained until sleep occurs naturally. There are two recommended postures for lying meditation: Posture 1: Lying on the right side (see Figure 2.15) and Posture 2: Lying flat on the back (see Figure 2.16)

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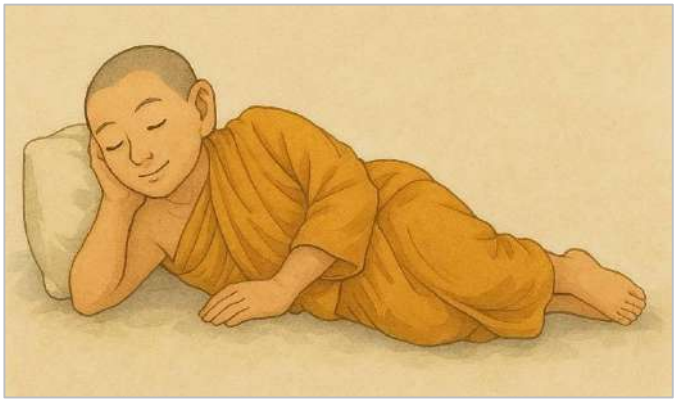
[33] D II 292.

[34] D II 292; Maurice Walshe (tr.), *The Long Discourses of the Buddha.: A Translation of Dīgha Nikāya*, p. 336.

[35] Phrakhrubhawana Waralangkara, *Handbook of Vipassanā Meditation for Beginners*, pp. 60–61.

Figure 2.15 Illustration of Lying Meditation Posture 1: Lying on the right side



Source: Figure created by Nadnapang Phophichit, Ph.D., using generative AI.

Figure 2.16 Illustration of Lying Meditation Posture 1: Lying on the back

Source: Figure created by Nadnapang Phophichit, Ph.D., using generative AI.

The following are the step-by-step instructions for lying meditation:

1. Begin by becoming clearly aware of all bodily movements as you prepare to recline.

2. While transitioning into the lying position, mentally note “leaning, leaning, leaning.”

3. As different parts of the body such as the elbow, hip, back, or head make contact with the surface, note “touching, touching, touching.”

4. Once settled into either of the two postures, note the position with “lying, lying, lying.”

5. After lying down completely, gently close the eyes and direct attention to the abdomen. When it rises, mentally note “rising, rising, rising”; when it falls, “falling, falling, falling.” Alternatively, continue with “lying, touching” in accordance with the bodily sensations until sleep naturally occurs. Upon waking, resume mindfulness with awareness of the new present moment.

C. Guidelines on What to Avoid During Lying Meditation

Lying meditation can provide deep relaxation and clarity when done correctly, but it also presents unique challenges that may lead to drowsiness or loss of mindfulness. Ensuring that the practice remains intentional and alert requires avoiding behaviors that weaken concentration or encourage sleepiness. The following guidelines are intended to help practitioners stay aware and attentive while practicing lying meditation.

1. Before beginning the practice, it is essential to understand that the goal is to maintain gentle and continuous awareness without causing strain. Certain behaviors may hinder mindfulness or disturb the transition to rest. The following guidelines outline actions to avoid:

2. Do not open the eyes or concentrate intensely on the body, as this may distract from relaxed awareness.

3. Avoid worrying about whether sleep will happen during the rising or falling of the abdomen—this can lead to unnecessary tension.

4. Refrain from frequently moving or turning the body, as it interrupts mindfulness.

5. Do not force the breath to exaggerate abdominal movement; doing so may cause fatigue or restlessness, disrupting both the current session and subsequent practice.

1.3 Clear Awareness (*sampajānapabba*): Beyond the four primary postures, the practitioner is instructed to be clearly aware during all minor movements and actions – for example, in going forward or returning, in looking ahead or looking away, in bending and stretching the limbs, in eating, drinking, chewing, tasting, in urinating and defecating, in walking, standing, falling asleep and waking, in speaking or remaining silent, and so on. In all such activities, one practices "clear comprehension" of what is happening and one's purpose, domain, and suitability of the action. This extension of mindfulness to daily routine trains the meditator to stay mindful and fully present in each moment, not just during formal sitting meditation. It ties the contemplative practice directly into the fabric of daily life and prevents any lapse into heedlessness.

1.4 Reflection on the Repulsive: Parts of the Body (*paṭikūla-manasikārapabba*): The meditator contemplates the unattractive aspects of the body to counteract lust and develop detachment. The *sutta* suggests reviewing the body as composed of "thirty-two parts," such as head hairs, body hairs, nails, teeth, skin, flesh, bones, bone marrow, organs, various fluids, etc., considering "this body as it actually is" filled with these impure constituents[36]. By mentally dissecting the body into these parts, one breaks the illusion of a beautiful, static body and instead sees it as a collection of impersonal elements. A meditator might systematically visualize each part and mentally note its characteristics (color, shape, location) – an exercise the commentaries describe in detail – to truly internalize the body's nature.

1.5 The Four Elements (*dhātumanasikārapabba*): Here one views the body in terms of the four primary elements (*dhātu*): earth (solidity), water (cohesion/liquidity), fire (temperature), and wind (motion/air). The text instructs the meditator to analyze that in the body, there is the earth element, the water element, the fire element, the air element, understanding that the material body is nothing but these

[36] M I 57–58.

four forces or qualities[37]. This contemplation further reduces the sense of a personal, living "being" and instead sees the body as an interplay of physical forces – hardness/softness, fluidity, warmth, and motion. One might, for example, observe the hardness of bones as the earth element, the heat of digestion as the fire element, the bodily fluids as water element, the movement of lungs and intestines as air element, etc. By doing so, attachment to the body as "I" or "mine" is weakened.

1.6 The Nine Charnel-Ground Contemplations (*navasivathika-pabba*): In the time of the Buddha, it was possible for monks to visit charnel grounds and observe corpses in various stages of decay. The *Satipaṭṭhāna Sutta* invites the practitioner to contemplate a body after death – from a fresh corpse, to one that is bloated, one being eaten by animals, one reduced to skeleton with flesh, then skeleton without flesh, disjointed bones, and eventually bones crumbling to dust. The meditator reflects that the body is of the same nature, it will be like that, and that it is not exempt from that fate[38]. This powerful contemplation on death and decay instills a deep sense of impermanence (*anicca*) and non-self, and it uproots vanity and attachment to the body. Even if one cannot see an actual corpse, the *sutta* encourages using vivid visualization or imagination to simulate this awareness of the body's mortality. It is a classic Buddhist meditation on the inevitability of death and the foul nature of a decaying body, directly supporting insight into the true frailty of material existence.

These six methods (breathing, postures, activities, parts, elements, corpse reflections) collectively constitute mindfulness of the body. Each method is a stand-alone meditation subject, yet all aim at establishing a detached, clear awareness of the body's nature. After describing each, the *sutta* repeats a unifying refrain[39]. This important refrain (repeated for each foundation) gives the general meditation instructions: one can observe one's own body (internally) or others' bodies (externally)

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[37] M I 58.

[38] M I 58–59.

[39] M I 56–59.

– for example, comparing how all bodies share the same nature – and one pays attention to the process of arising and passing away (e.g. the breath arises and passes, feelings come and go, etc.), to cultivate insight into impermanence. One keeps mindfulness just at the level of bare observation (knowing "there is a body" or "there is this process"), without extraneous conceptualizing. And crucially, one does not cling to anything one observes; one remains detached and lets experiences arise and cease. This refrain effectively instructs the meditator in how to observe: with impartiality, keen insight into impermanence, and no identification with the phenomena. It shows that the method of *satipaṭṭhāna* is not only the specific objects (breath, feelings, etc.) but also the way they are observed – diligently, equanimously, and with penetrative insight into their arising and dissolution.

Based on the above literature review, it is evident that among the fourteen methods of Contemplation of the Body (*kāyānupassanā*) in the *Satipaṭṭhāna Sutta*, only three are explicitly classified by the commentators as direct *Vipassanā* (insight) meditation practices: the contemplation of the four postures (*iriyāpathapabba*), clear awareness (*sampajānapabba*), and contemplation of the four elements (*dhātumanasikārapabba*). These practices are aimed at cultivating insight directly into the nature of reality. Therefore, the Four Foundations of Mindfulness-Based Intervention (FFMBI) is developed with a particular focus on these direct *Vipassanā* practices and is based on the Buddhist scriptural foundation, in order to support insight development and examine its effects on the body and mind of the practitioners.

2. The Contemplation of Feelings (*vedanānupassanā*)

Moving to the Contemplation of Feelings (*vedanānupassanā*), the practice here is to observe feelings as feelings. In Buddhism, *vedanā* means the affective tone of experience – feeling can be pleasant, unpleasant (painful), or neutral. The *Satipaṭṭhāna Sutta* instructs: "He understands feelings: when experiencing a pleasant feeling, 'I feel a pleasant feeling'; when experiencing a painful feeling, 'I feel a painful feeling'; when experiencing a neither-pleasant-nor-painful feeling, 'I feel a neutral feeling.' He

understands a pleasant feeling of the senses as what it is, and a pleasant feeling not of the senses (spiritual joy) as what it is, and likewise for painful and neutral feelings."[40].

In practice, this means the meditator notes the feeling-tone accompanying each experience in the present moment. For example, while observing the body or the mind, various feelings will arise: an itch might be felt as unpleasant, a sense of tranquility as pleasant, or many moments may be neutral. The meditator's task is simply to be aware of the feeling quality without reaction. If pain arises in the legs during sitting, one notes "painful feeling" objectively, instead of reacting with aversion or panic. If a pleasant mellow feeling arises with a deep breath, one notes "pleasant feeling," without clinging to it.

The mention of "worldly vs. unworldly" (or "of the flesh vs. not of the flesh") feelings indicates the distinction between ordinary sense pleasures/pains and the more refined feelings associated with meditative absorptions or spiritual joy. In either case, the meditator discriminates and knows the type of feeling present. This contemplation helps one understand the fleeting nature of feelings and how craving and aversion are conditioned responses to them. By mindfully observing feelings, one can experience unpleasant feelings without suffering (by not identifying or resisting), and pleasant feelings without getting attached – a key step in breaking the habitual chain of reactivity.

3. The Contemplation of Mind (*cittānupassanā*)

Next, the Contemplation of Mind (*cittānupassanā*) involves mindfulness of the states of one's own mind or consciousness. The sutta lists a series of paired mental states to be recognized: For example, mind with lust and mind without lust, mind with hatred and mind without hatred etc.[41] This series prompts the meditator to be aware of the quality or mood of the mind in the present moment. Essentially, one turns attention

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[40] M I 59; Bhikkhu Ñāṇamoli & Bhikkhu Bodhi (tr.), *The Middle Length Discourses of the Buddha*, p. 149.

[41] M I 59–60.

inward to observe the state of consciousness itself, rather than a particular object. For example, at a given moment the mind might be filled with desire or greed – the practitioner notes "lustful mind" without judgment. At another moment, the mind may be free of lust – one notes "lust-free mind."

Similarly for hatred (anger, aversion) and delusion (dullness, confusion): one takes stock of whether those are present or absent. The other terms cover whether the mind is shrunken (slothful or depressed) or restless, whether it is in a higher state (such as absorbed in meditation) or ordinary, whether it is concentrated or not, and whether it is temporarily released (for instance, through strong insight or *jhāna*) or still bound. In practical terms, a meditator might sit and simply check the mind's condition: "Is there craving in my mind? Is there aversion? What is the predominant tone right now? Is the mind collected or wandering? How clear or confused is it?" This builds a reflexive awareness of consciousness.

By observing the mind in this way, one learns to recognize transitory mental states without identifying with them ("the angry mind" rather than "I am angry"). It also helps one cultivate wholesome states: recognizing a distracted mind can cue one to re-establish focus; recognizing absence of hatred can encourage and extend that peaceful state. Mind contemplation is thus a powerful tool for self-knowledge and monitoring one's progress. It shines a light on the normally subjective flow of thoughts and moods, making them objects of mindfulness. The development of this practice leads to an equanimous observation of all mental states – good or bad – as passing conditions, which is essential for insight.

4. The Contemplation of Mental Objects or Phenomena (*dhammānu-passanā*)

Finally, the Contemplation of Mental Objects or Phenomena (*dhammānu-passanā*) is a broad category that encompasses multiple frameworks of analysis. Here *"dhammas"* refers to various categories of teachings or mental content that one can directly observe. The *Satipaṭṭhāna Sutta* highlights five key sets of phenomena to be contemplated under this fourth foundation:

4.1 The Five Hindrances (*nīvaraṇa*): During *satipaṭṭhāna* practice, the meditator should recognize that there is sensual desire or there is no sensual desire, and he should also know how the arising of unarisen sensual desire comes to be; he knows how the abandoning of arisen sensual desire comes to be; and he knows how the future non-arising of the abandoned sensual desire comes to be. The same pattern is repeated for the other hindrances: ill-will, sloth-and-torpor, restlessness-and-worry, and doubt[42]. In practice, this means one uses mindfulness to recognize whenever one of these five hindrances is present in the mind, understanding it as a hindrance. For example, if during meditation one's mind is overcome by craving or sensual desire, one notes its presence ("lust/greed is present"). One also notes when it has subsided ("lust is absent"). Moreover, one investigates cause and effect with regard to the hindrance: what triggered this desire? How was it abandoned (through applying a counter-measure or by itself)? And how can one prevent it in the future? This transforms mindfulness into an insightful examination of the conditioning factors of the mind.

Similarly, if dullness (sloth) sets in, the meditator acknowledges it, discerns perhaps that it arises from, say, having eaten a heavy meal or from lack of stimulating object, and applies effort or switches posture to overcome it, and notes the brighter mind when sloth is gone. In essence, one is observing defilements as impersonal conditions: this undermines their power. The hindrances are considered the main obstacles to meditation, so knowing their patterns is extremely beneficial. By mindfully working through hindrances in this way, the practitioner diminishes their influence and strengthens concentration and clarity.

4.2 The Five Aggregates (*pañcakkhandha*): The meditator reflects on the aggregates of clinging – form, feeling, perception, mental formations, consciousness – which constitute the entirety of an individual's psycho-physical existence. Here one uses mindfulness to observe any experience in terms of these aggregates. For example, take the simple act of breathing: the form aggregate is the physical sensation of the

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[42] M I 60.

breath, the feeling aggregate might be neutral or pleasant sensation associated, perception is recognizing "breath" or the labels in mind, formations are the volitions or attentional adjustments, and consciousness is the awareness of it. The meditator notes how each of these arises and passes.

In a more general sense, this contemplation encourages insight into non-self: one sees that any aspect of oneself can be categorized into one of these five groups, each of which is impermanent and conditioned. For instance, feeling arises and passes; perceptions change; thoughts (formations) come and go; consciousness itself is momentary and dependent on conditions. By observing these processes, one learns not to regard any aggregate as "I" or "mine." This is a direct way of applying mindfulness to deconstruct the notion of an enduring self. It aligns with the Buddha's standard teaching that understanding the true nature of the five aggregates (as impermanent, unsatisfactory, and not-self) is crucial for liberation.

4.3 The Six Sense-Bases (*ṣaḷāyatana*): This involves mindfulness of the sense spheres – eye and visible forms, ear and sounds, nose and odors, tongue and tastes, body and tangibles, mind and mental objects – and the fetters that arise dependent on them[43]. In practice, this is an application of mindfulness whenever a sense experience occurs. For example, when seeing occurs, one notes simply "seeing, visible form" and also notices any fetter (like lust if the form is attractive, or aversion if it is unpleasant) arising with it. One then notes how that fetter can be let go. This contemplation is closely related to guarding the sense-doors: being mindful at the moment of contact so that unwholesome reactions do not proliferate.

By understanding sense experience in this structured way, the meditator gains insight into how contact leads to feeling and then to craving if unchecked – essentially observing Dependent Origination on a micro scale at each sense door. This practice highlights the conditioned nature of sensory life and the importance of mindfulness at the point of contact to prevent defilements. It is a very practical training

[43] M I 61.

for daily life, as one constantly encounters sights, sounds, etc. With practice, one might notice, for instance, "Seeing a form -> liking arises (fetter of lust) -> now mindfully note liking and let it dissolve." Over time, this weakens reactive habits and facilitates a mind that can experience the world with equanimity.

4.4 The Seven Factors of Enlightenment (*satta bojjhaṅgā*): The meditator develops mindfulness of the *bojjhaṅgas* – mindfulness, investigation of states, energy, rapture, tranquility, concentration, and equanimity – noting whether each is present or absent and knowing how they arise and come to fulfillment[44]. This part of the practice is somewhat more advanced: it assumes the meditator has cultivated these factors to some degree. Essentially, as one's practice deepens, one begins to recognize the awakening factors as they emerge. For example, one maintains mindfulness continuously – that itself is the first factor. As one investigates phenomena (*dhamma-vicaya*) and gains insight, that investigative factor is present.

When energy/effort is balanced, the factor of *viriya* is present. A pleasurable interest or joy (*pīti*) often arises when the mind becomes concentrated – the meditator notes this rapture but also knows to balance it with tranquility (*passaddhi*) so it doesn't lead to excitement. Then a deep concentration (*samādhi*) can occur, which the meditator is aware of as a factor. And throughout, equanimity (*upekkhā*) may develop towards all experiences. The practice here is to cultivate and *tune* these seven factors, knowing which need encouragement or balancing. The commentary notes that some factors are activating (like investigation, energy, rapture) and others are calming (tranquility, concentration, equanimity), with mindfulness in the middle guiding the process.

Mindfulness of these factors means the meditator can assess: Is my practice lacking energy? If so, arouse the energy factor. Is it too excited (excess *pīti*)? Then strengthen tranquility and equanimity. In doing so, one methodically brings the seven factors to maturity, which culminates in enlightenment. This contemplation is

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[44] M I 62.

essentially an introspective quality control of one's meditation – a feedback loop where mindfulness monitors the presence/absence and balance of the very qualities that lead to awakening.

4.5 The Four Noble Truths: (This fifth section appears explicitly in the *Mahāsatipaṭṭhāna Sutta* of the *Dīgha Nikāya*,and is absent or only implicit in the Majjhima version.) Here the meditator contemplates suffering, its origin, its cessation, and the path. The text in DN 22 expands in detail: one reviews the Truth of Dukkha (the various forms of suffering: birth, aging, death, sorrow, lamentation, pain, grief, despair, association with the unloved, separation from the loved, not attaining one's wishes – in short, the five clinging-aggregates are suffering); the Truth of Origin (craving, the cause of suffering, to be abandoned); the Truth of Cessation (fading away of craving, cessation of suffering, to be realized); and the Truth of the Path (the Noble Eightfold Path, to be developed)[45].

In meditation, one might integrate this by recognizing instances of these truths in one's experience. For example, the first truth is seen every time one observes unsatisfactoriness or affliction in experience (e.g. the pain in the body, the stress in mind – this is *dukkha*). The second truth is seen when one notices craving or attachment as the immediate cause of stress (e.g. craving for the pain to go away is causing additional suffering). The third truth can be glimpsed in moments when letting go of craving leads to relief and peace (even a momentary cessation of a particular suffering when the mind relinquishes desire).

The fourth truth is essentially the practice itself – one is cultivating the path factors (mindfulness being one of them) as one practices. By contemplating in terms of the Four Truths, the meditator aligns their personal insights with the deepest framework of the Dhamma. It ensures that one's insight into impermanence, suffering, and non-self is contextualized as understanding the very principles the Buddha

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[45] D II 305–314; Maurice Walshe (tr.), *The Long Discourses of the Buddha.: A Translation of Dīgha Nikāya*, p. 344.

awakened to. In the *Satipaṭṭhāna c*ontext, bringing in the Four Truths serves as a capstone that ties together all the preceding contemplations: one sees that the aggregates, sense bases, etc., all fall under *dukkha* when clung to; that the hindrances and defilements are manifestations of *taṇhā* (craving, the origin); that letting them go even temporarily gives a taste of *nirodha* (cessation); and that mindful cultivation is part of the *magga* (path). Thus, *satipaṭṭhāna* practice culminates in a direct experiential understanding of the Four Noble Truths, which is tantamount to enlightenment in the Theravāda understanding.

In all these methods, mindfulness is the driving faculty. The role of the practitioner is to keep their attention grounded in the present reality of body, feelings, mind, and dhammas, observing without attachment or aversion. Technique-wise, different meditation lineages might emphasize one or another exercise (for instance, some may specialize in mindfulness of breathing as a primary practice, while others might start with body parts or feelings). But ultimately, a well-rounded practice will incorporate all four foundations in a complementary way. The Buddha did not necessarily intend for these contemplations to be entirely separate silos; they can be developed in tandem. For example, while doing breathing (body), one will also notice feelings and states of mind and can note those – thus, in intensive practice the boundaries blur and all four foundations of mindfulness are developed together.

To summarize the methodology: the four foundations of mindfulness practice involves systematic introspective observation. One begins with a chosen primary object (like breath or walking) to anchor mindfulness, and then one expands to notice whatever arises in the field of experience, noting which category it belongs to. The meditator continuously applies mindfulness internally (to one's own mind-body) and occasionally externally (to others or to the general nature of phenomena, recognizing that all beings experience the same sort of feelings, etc., which can enhance objectivity and compassion). One observes the arising and passing of all phenomena, thereby cultivating insight (*vipassanā*) into the impermanent, unsatisfactory, and selfless nature of reality. Through diligent and balanced practice (with the effort and clear comprehension emphasized under body contemplation, and the investigative wisdom

applied especially under dhamma contemplation), the four foundations of mindfulness develop both calming stability and penetrative understanding. The method is often described as one of "bare attention" and continuous, moment-to-moment noting of phenomena, which leads to a profound transformation of one's perspective – from identification with the body and mind to seeing them as conditioned processes. In effect, the *Satipaṭṭhāna* method gradually erodes the delusion of a permanent self and uproots craving and aversion, the forces that sustain suffering.

2.1.4 The Purposes of Four Foundations of Mindfulness Practice

The purpose of cultivating the four foundations of mindfulness is explicitly stated in the texts and commentaries as the purification and liberation of the mind. As noted, the Buddha introduced the *satipaṭṭhāna* teachings with a comprehensive statement of its objectives: the purification of beings, the overcoming of sorrow and lamentation, the disappearance of pain and grief, the attainment of the right path, and the realization of *Nibbāna*. Each of these five phrases highlights an aspect of the goal:

2.1.4.1 Purification of beings (*sattānaṁ visuddhī*): This refers to cleansing the mind of defilements (greed, hatred, delusion). By diligently observing experience with mindfulness and equanimity, the practitioner purifies their mind at the deepest level. Theravāda exegesis often speaks of seven stages of purification (as outlined in the Visuddhimagga), beginning with purification of virtue and culminating in purification by knowledge and vision. *Satipaṭṭhāna* primarily accomplishes the purifications of mind and view – concentrating and clearing the mind, and yielding the clear insight that purges wrong views and ignorance. In simple terms, purification means the practitioner becomes a better, more enlightened being, free from the "stains" of mental impurities.

2.1.4.2 Overcoming sorrow and lamentation (*soka-paridevānaṁ samatikkamāya*): Sorrow (*soka*) and lamentation (*parideva*) are terms for mental suffering and its outward expression (crying, wailing). The practice of mindfulness directly addresses the root causes of emotional suffering. By seeing the impermanent and impersonal nature of all experiences, the meditator is able to let go of attachments

that lead to sorrow. One who practices *satipaṭṭhāna* learns to face loss, pain, and change with balance, thus overcoming the grief that would normally overwhelm an untrained mind. In a very immediate sense, a mindful person catches the arising of sorrow and, rather than proliferating it, observes it and allows it to pass, thus cutting it off. Over time, this greatly diminishes the habit of lamenting over life's vicissitudes. The Buddha taught that mindfulness practice offers a path to alleviate emotional suffering by transforming the way one relates to experience.

2.1.4.3 Disappearance of pain and grief (*dukkha-domanassānaṁ atthangamāya*): The phrase *dukkha-domanassa* can be translated as physical pain (*dukkha* in the specific sense) and mental grief or displeasure (*domanassa*). It signifies the spectrum of suffering, both bodily and mental. *Satipaṭṭhāna* practice is aimed at the cessation or vanishing of these. On the ultimate level, this refers to *Nibbāna* – the cessation of all suffering. But even on a momentary level, a practitioner skilled in mindfulness can endure painful feelings (such as illness or injury) with far less distress; often the "pain" may be there, but the "suffering" (the mental anguish layered on top of pain) is gone. Mental grief, too, is alleviated as one learns not to fuel depressive or anxious thoughts. The practice brings about a state of inner peace and imperturbability in the face of what previously would have caused pain and grief. In the *Satipaṭṭhāna Saṃyutta*[46], the Buddha also emphasizes the importance of the contemplation on the four foundations, both for beginners and advanced practitioners. Thus, the purpose is very much the therapeutic one of curing the universal illness of suffering – literally making pain and sorrow vanish by uprooting their causes (ignorance and craving).

2.1.4.4 Attainment of the right path (*ñāyassa adhigamāya*): This means realizing or entering the path of Dhamma, i.e. the Noble Eightfold Path or the supramundane path leading to enlightenment. *Satipaṭṭhāna* is identified as a direct path (*ekāyana magga*) – it not only is the way to the goal, but walking it is itself the fulfillment of the Noble Path. As one practices the four foundations, one is

[46] S V 145.

simultaneously developing multiple path factors: Right Mindfulness obviously, but also Right Effort (in the ardency of practice), Right Concentration (the mind becomes collected on the object), and Right View and Right Intention (as insight and detachment grow). Thus, the continuous practice of mindfulness is the cultivation of the path. The Buddha often described *satipaṭṭhāna* as the "direct approach" for those seeking the path. The commentaries explain "attainment of the right path" as reaching the noble path of stream-entry and beyond (the first moment of transcendent realization that guarantees liberation). In practical terms, this purpose reminds practitioners that *satipaṭṭhāna* is not an end in itself but a means to attain the noble path knowledge, the breakthrough of wisdom that ushers one into sanctity (*ariya-phala*). The *ñāya* (literally "method" or "right way") here implies the exact insight into the Four Noble Truths which constitutes the noble path. So the purpose is to lead the meditator to that liberating insight – essentially, to become a stream-enterer, once-returner, non-returner, or arahant through mindfulness.

2.1.4.5 Realization of *Nibbāna* (*nibbānassa sacchikiriyāya*): This is the ultimate goal – to directly realize Nibbāna, the cessation of all defilements and suffering. All the previous purposes culminate in this one. The practice of the four foundations of mindfulness is intended to bring the meditator to the experiential realization of the Deathless (*Nibbāna*), the unconditioned state which is the final liberation. "Realization" (*sacchikiriyā*) implies a personal, direct witness of *Nibbāna*, as opposed to mere intellectual understanding. In the classical formulation, when insight is perfected through mindfulness meditation, it gives rise to supramundane wisdom at the moment of path attainment, and the object of that wisdom is *Nibbāna* itself. Thus, the Buddha unequivocally presents *satipaṭṭhāna* as a vehicle to enlightenment – not just as a technique for stress reduction or ethical living (though it aids those too), but as the means by which one penetrates the highest truth. The commentaries underline that at the moment of path and fruition (*magga-phala*), the mind is intently mindful of *Nibbāna*, having let go of all conditioned phenomena. *Satipaṭṭhāna*, steadily cultivated, leads to that moment of mindful leap to the unconditioned. Therefore, the purpose of

the practice is nothing short of arahantship, the complete destruction of the taints (*āsavas*) and full liberation of mind and wisdom.

In summary, the four foundations of mindfulness are practiced for the sake of purification, overcoming all forms of sorrow and distress, and for walking the path to its final goal, *Nibbāna*. These purposes encompass both the therapeutic aspect (healing and removing suffering) and the transcendent aspect (gaining liberating wisdom). The breadth of the phrasing shows that *satipaṭṭhāna* is a holistic practice affecting the practitioner at every level: psychologically (it relieves grief and distress), ethically (it purifies one's mind from defilements), and spiritually (it brings one to the supramundane path and *Nibbāna*).

The commentarial literature often remarks that all five of these stated purposes boil down to the last: the realization of *Nibbāna*. When *Nibbāna* is realized, the mind is purified, sorrow and pain cease, and the path has been fulfilled. Therefore, in practical terms, a meditator keeps these purposes in mind as the motivation for practice. One understands that by cultivating mindfulness in day-to-day sitting and walking, one is actually working toward nothing less than the end of all suffering. This can inspire diligent practice and also correct any misconception that mindfulness is a dry or mechanical exercise – it is in fact charged with the purpose of awakening. The purposes articulated by the Buddha ensure that practitioners maintain a sense of direction: the repetitive noting of breath, feelings, mind states, etc., is in service of the highest spiritual emancipation.

2.1.5 The Results of Four Foundations of Mindfulness Practice

One famous passage promises that if a person develops these four bases of mindfulness "for seven years, one of two fruits could be expected for him: either final knowledge here and now, or if there is a trace of clinging left, non-return" It goes on to reduce the time frames: even "for six years… five years… one year… seven months… one month… half a month… or even seven days" of truly earnest practice, the same two

results can be expected[47]. This startling assurance – repeated at the conclusion of both the *Majjhima* and *Dīgha* versions of the *Satipaṭṭhāna Sutta* – underscores the canonical view that mindfulness, when practiced diligently, has tremendous power to accelerate one's spiritual progress.

When the four foundations of mindfulness are cultivated, the Buddhist texts assert that tangible results will follow – culminating in the highest fruits of the path. In the *Satipaṭṭhāna Sutta* itself, as discussed, the Buddha makes the bold guarantee that one who earnestly practices these contemplations can attain awakening in a remarkably short time. The text says that even seven days of well-practiced mindfulness can be enough to achieve either Arahantship (full enlightenment) or *Anāgāmī* (Non-Return, the third stage of holiness) at the least, if the conditions are ripe[48].

This famous passage is meant to emphasize the potency of the method – it is the fast track to enlightenment. The commentaries add that not everyone will realize the fruit in seven days, but the point is that the practice is so powerful that it can lead to awakening very quickly, and will inevitably do so in time, yielding "one of two results: knowledge here and now or the state of non-return" (i.e. no falling short of Non-Return at minimum). Thus, the ultimate result of four-foundations mindfulness is the attainment of the noble fruits: Stream-entry, Once-return, Non-return, and Arahantship, depending on one's progress. In particular, Arahantship – the complete eradication of greed, hatred, and delusion – is the final result; short of that, Non-return (which eradicates sensual lust and ill-will) is assured for the devoted practitioner. These claims underscore that *satipaṭṭhāna* is intended to be a path to enlightenment in this very life. Indeed, many episodes in the *Pāli* Canon relate that practitioners (monastics and lay alike) attained one of the noble stages of awakening while engaging in *satipaṭṭhāna* meditation, sometimes even during the Buddha's discourse on it.

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[47] M I 62–63; Bhikkhu Ñāṇamoli & Bhikkhu Bodhi (tr.), *The Middle Length Discourses of the Buddha*, pp. 155–156.

[48] M I 63; Ibid., p. 155.

On the way to these ultimate results, there are intermediate fruits that manifest as the direct outcome of mindfulness practice. One immediate result is the development of deep concentration (*samādhi*). Although *satipaṭṭhāna* is often classed as an insight practice, the Buddha in this *sutta* points out that it also generates strong focus. As one continually anchors mindfulness on the present object (e.g. the breath or the walking step), the mind becomes collected and steady. Thus, a practitioner often experiences access concentration or even full absorption (jhāna) as a by-product of *satipaṭṭhāna*. For example, mindful breathing can lead to the first *jhāna* if pursued single-mindedly. One result is a concentrated, calm mind, which itself is a state of great inner happiness and peace (a fruit enjoyed even before enlightenment).

Another observable result is the weakening of the five hindrances. As mindfulness and insight grow, the hindrances (sensual desire, ill-will, dullness, restlessness, doubt) lose their grip. The mind of a diligent *satipaṭṭhāna* practitioner tends to become more content and less plagued by craving; more kind and forgiving, thus less often irritated; more energetic and alert, overcoming sloth; more peaceful, overcoming restlessness; and more confident in the practice, dissolving doubt. These changes are often reported by meditators even after a period of intensive retreat – they notice a significant reduction in anxiety, sensual obsession, and negative emotions. The Buddha specifically stated that the development of the four foundations of mindfulness leads to the abandonment of the defilements and, conversely, to the growth of the seven factors of enlightenment[49].

Thus, the arising of the enlightenment factors (mindfulness, investigation, energy, rapture, tranquility, concentration, equanimity) is itself a result of *satipaṭṭhāna* practice. For instance, as one keeps noting phenomena, the factor of sati (mindfulness) becomes continuous. Mindfulness, in turn, triggers *dhamma-vicaya* (investigation) – the meditator starts discerning patterns and characteristics (such as impermanence) in experience. This clear seeing gives a joyful interest (*pīti*), accompanied by a serene

[49] S V 190.

passaddhi (tranquility) as the mind lets go of worries. The mind gathers in *samādhi* (concentration) and, seeing phenomena with balance, develops *upekkhā* (equanimity). These seven factors emerging is a classic sign of progress in insight meditation. They indicate that the practitioner is approaching the threshold of awakening. In one discourse the Buddha said: "When the seven factors of enlightenment are developed and cultivated, they fulfill understanding and liberation"[50]. Their presence in a meditator's continuum is therefore a result of practice and an assurance that the final goal is near.

A further result of *satipaṭṭhāna* practice, closely tied to the above, is the progressive attainment of insight knowledges (*vipassanāñāṇa*) as described in the commentarial Progress of Insight (*vipassanā-ñāṇakrama*). Although the canonical *sutta* itself does not enumerate these stages, in practical *Theravāda* teaching it is understood that a meditator will experience a series of transformative insights. For example, a dedicated practitioner starts by discerning the difference between mind and matter, then clearly sees cause and effect, then directly perceives the arising and passing of phenomena. This typically leads to powerful experiences like the "knowledge of dissolution" (seeing everything breaking up moment to moment), which can cause a dramatic shift in perspective (sometimes accompanied by fear or disenchantment as one viscerally realizes nothing is stable).

Further practice brings the knowledge of equanimity towards all formations – a state of deep poise and neutrality. From there, the mind is poised to leap to the supramundane path. All these insight knowledges are fruits of *satipaṭṭhāna* meditation; they are basically a detailed map of the gradual purification of vision the Buddha promised. The occurrence of these insights is documented in meditation texts and reports from experienced practitioners, and they serve as milestones. One can say that the experiential insight into the three marks of existence (impermanence, suffering, non-self) is a crucial result of four foundations of mindfulness. The meditator comes to see

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[50] S V 72.

clearly that all conditioned phenomena observed – whether body, feeling, mind state, or mental object – share these three marks. This insight is not merely conceptual but is felt as a profound shift in how one perceives reality. Such insight weakens and ultimately destroys ignorance (*avijjā*), paving the way for liberation.

On a more mundane level, even before reaching lofty attainments, practitioners of *satipaṭṭhāna* often report significant positive changes in their mental health and character. These could be considered beneficial results of the practice in a provisional sense. For example, increased mindfulness leads to better self-control and ethical behavior. One becomes less reactive and more thoughtful in daily life. Emotions become more balanced: mindfulness has an inherent grounding effect that reduces anxiety and obsessive rumination. Concentration and mindfulness together improve one's cognitive clarity and focus, which can benefit study or work. Furthermore, many experience a rise in compassion and empathy (since by observing one's own mind-body processes, one understands the universality of suffering and is inclined to be kinder to others).

While these are not the ultimate "results" emphasized in the texts, they are nonetheless notable outcomes observed as the practice takes root. The Buddha sometimes highlighted that a mindful person lives in comfort because even in this life he is relatively free from the torments of unwholesome states[51]. The *Satipaṭṭhāna Sutta* itself, by culminating in the Four Noble Truths, indicates that the practitioner will develop right view and knowledge. So one result is a profound understanding of Dhamma – the practitioner verifies through personal insight the truths taught by the Buddha. This experiential knowledge is far more stable and unshakable than mere faith. It results in confidence (*saddhā*) that is said to be "liberation-rooted," because it is based on seeing for oneself.

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[51] M III 79.

Ultimately, the final result of fully perfected *satipaṭṭhāna* is the attainment of *Arahatta-phala*, the fruit of Arahantship, which is the complete liberation of the mind without remainder of clinging. At this point, the purpose and the result coincide: the practice has fulfilled its aim. The Arahant lives mindfully but without any further effort needed to uproot defilements, as they are all gone. The *Mahā Satipaṭṭhāna Sutta* ends with the monks rejoicing at the Buddha's words, implying that they had confidence in these promised results[52]. Over the centuries, countless *Theravāda* practitioners have taken up this practice with the faith that it leads to the highest fruits. The historical record in the commentaries often attributes the awakening of famous elders to their practice of *satipaṭṭhāna*. For instance, it is said that the Elder *Kāla* attained Arahantship while contemplating feeling, and the Elder *Bhaddiya* while contemplating the elements – exemplifying that any of the four foundations can lead to the final result if developed to maturity.

In conclusion, the results of four foundations of mindfulness practice span from immediate improvements in mindfulness, concentration, and insight, through the attenuation of obstacles and development of awakening factors, up to the irreversible attainment of the noble stages of enlightenment. As the Buddha confidently stated, whosoever shall practice these four foundations shall realize the fruit, thereby affirming that the Dhamma does not fail the diligent practitioner[53]. This promise of results has been a source of inspiration for practitioners through the ages, and it underscores the transformative power of *satipaṭṭhāna* when applied correctly.

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[52] D II 315.

[53] M I 63.

2.1.6 The Benefits of Four Foundations of Mindfulness Practice

The benefits of practicing the four foundations of mindfulness are manifold, encompassing spiritual, psychological, and even physical dimensions. From a Theravāda perspective, benefits (*ānisaṁsa*) refer to the positive outcomes and advantages that one gains through a particular practice. In the case of *satipaṭṭhāna*, many benefits naturally flow even before the ultimate results are attained.

One fundamental benefit is the development of a high degree of mindfulness and clear comprehension in all aspects of life. As one trains in *satipaṭṭhāna*, one becomes fully present and awake to each moment. This heightened mindfulness has the benefit of improving one's quality of life: actions are done more efficiently and carefully, mistakes are fewer, and one's mind is collected rather than scattered. The Buddha stated that mindfulness is useful in "all situations" – it is like a guardian that keeps watch over the mind. A mindful person is less likely to break precepts or act unwholesomely, so a benefit of *satipaṭṭhāna* is the natural safeguarding of virtue (*sīla*). This creates a virtuous cycle: good conduct leads to a peaceful mind, which further aids meditation.

Another key benefit is insightful wisdom (*paññā*). By continuously observing the arising and passing of phenomena, the practitioner develops penetrating insight into the three characteristics (impermanence, suffering, non-self) in their own experience. This wisdom is not theoretical but experiential, and it carries over into how one responds to the world. One benefit, then, is a change in perspective: understanding the conditioned and fleeting nature of things, a person becomes less attached to material acquisitions and sensual pleasures, knowing they inevitably pass. One also becomes more equanimous in face of change, having seen deeply that "this is just the way things are." This constitutes a reduction in existential anxiety and clinging, which is a great benefit to one's mental well-being. The *Sīlavantasutta* says that a monk who contemplates impermanence in the five aggregates (which is part of *satipaṭṭhāna*)

"gains spiritual urgency (*saṁvega*) and detachment", which are proximate benefits leading toward liberation[54].

One can also speak of the therapeutic and psychological benefits of *satipaṭṭhāna*. Modern mindfulness-based therapies, which are inspired by but not identical to Buddhist mindfulness, have empirically demonstrated reductions in stress, anxiety, and depression among practitioners. In the traditional context, the *satipaṭṭhāna* meditator learns to face even difficult mental states (like fear, sadness, anger) with mindful equanimity, which tends to dissolve their power. Thus, a benefit is emotional resilience and stability. The mind trained in *satipaṭṭhāna* recovers more quickly from shocks and remains balanced through ups and downs. The *Sedaka Sutta* famously compares mindfulness to an acrobat looking after himself – implying that mindfulness practice protects the mind from the harm of defilements and emotional turmoil[55]. The Buddha even stated that mindfulness is helpful in the treatment of physical pain: in one discourse he describes how an uninstructed person experiences pain twice – once in the body and once in the mind through reactive lamentation – whereas a trained practitioner, though feeling bodily pain, does not compound it with mental distress[56]. Therefore, one benefit is a reduction in the subjective experience of pain and stress. This has been borne out by contemporary studies as well: long-term meditators often show higher pain tolerance and lower stress hormone levels. Ancient texts give examples such as the monk *Cakkhupāla*, who went blind but endured it mindfully without suffering in spirit[57], illustrating the fortitude conferred by mindfulness.

Another benefit is the eradication of the five hindrances and their replacement by positive qualities. *Satipaṭṭhāna* gradually weakens sensual craving, ill-will, dullness,

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[54] S III 21.

[55] S V 169.

[56] S IV 208–210.

[57] Dhp–a I 4.

restlessness, and doubt. The benefit of this is felt in everyday life – these hindrances are basically states that torment the mind. A person with less craving and ill-will is naturally more content and more kind. Less dullness means more alertness and engagement with life; less restlessness means more peace; and absence of doubt yields confidence and clarity of purpose. The Buddha in the *Satipaṭṭhāna Saṁyutta* said that cultivating the four foundations of mindfulness arises from cultivating the noble eightfold path[58]. Even before full liberation, a mind suffused with the enlightenment factors is an immediate benefit: for example, the factor of rapture (*pīti*) brings joy and zest into the mind; tranquility (*passaddhi*) brings deep peace; equanimity (*upekkhā*) brings stability. These are wholesome, healthy states. In practical terms, many meditators report that through mindfulness practice they experience more joy in simple things, a sense of lightness and even bliss at times, and a pervasive sense of inner calm. All of these can be counted as benefits bestowed by *satipaṭṭhāna*.

A significant benefit is improved concentration and memory. By training the mind to sustain attention on chosen objects and to observe details, one's general powers of concentration increase. This can positively affect daily tasks – work or study requiring focus becomes easier. Memory (the ability to remember what one did or said) is sharpened because mindfulness by definition is a form of recollection (sati literally means remembering to be attentive). A mindful person often finds they are less forgetful or absent-minded; they are more present and thus remember conversations or where they put the keys, etc. While these might seem mundane, in aggregate they improve one's efficiency and reduce the small frustrations of life (one doesn't lose things as often or make careless errors).

Another subtle benefit is the growth of virtues like patience, tolerance, and empathy. *Satipaṭṭhāna* involves patiently observing whatever arises without reaction. This inherently trains patience and forbearance. One learns to "sit with" discomfort rather than impulsively trying to escape it. Over time, this carries over to interpersonal

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[58] S V 184.

situations: one becomes more patient with others' shortcomings or with delays and difficulties. Tolerance and non-reactivity become part of one's character. Empathy grows because mindfulness of one's own suffering and mental processes illuminates the universal nature of these experiences – one understands that others, too, face anger, fear, pain, etc. This recognition can open the heart to compassion. In the *Satipaṭṭhāna Sutta*, when instructing to contemplate internally and externally, an implied benefit is recognizing that others undergo the same processes ("externally" can mean considering others' bodies, feelings, minds) – this can erode selfishness and cultivate empathic concern. Though loving-kindness (*mettā*) meditation is a distinct practice, mindfulness provides a foundation for it by making one aware moment-to-moment of when one is slipping into ill-will and enabling one to correct it. Many practitioners note they become kinder and less judgmental as a side-effect of insight meditation.

It is also worth noting that mindfulness practice yields the benefit of clarity in decision-making and problem-solving. When the mind is collected and observing clearly, one tends to see situations as they are, rather than through a haze of emotion or bias. Thus, decisions made with mindfulness are often wiser and more considered. The Buddha said that one endowed with mindfulness and clear comprehension acts with wisdom in all affairs[59]. This can lead to better outcomes in one's work, relationships, and general life management – a pragmatic benefit.

From the ultimate standpoint, of course, the greatest benefit of *satipaṭṭhāna* is the attainment of the Deathless (*amata*) – liberation from the cycle of rebirth. This might be framed as the result, but it is also a benefit in the broad sense of being the highest benefit one can obtain. The *Pāli* canon sometimes uses the term *ānisaṁsa* to refer to the benefits of reaching Nibbāna, such as being freed from all future suffering, experiencing unshakable peace, and so forth. In this sense, *satipaṭṭhāna* yields the benefit of the highest happiness (*parama-sukha*), which is Nibbānic bliss, described as the cool relief when the fires of greed, hate, and delusion have been extinguished

[59] M I 272–280.

(*nibbāna* means "cooling"). The path to that benefit is gradual, but every step on the way brings incremental benefits as outlined above.

The commentaries often summarize the benefits of *satipaṭṭhāna* practice in terms of here and now, and hereafter. Here and now, one lives with a mind that is collected, purified, and free of distress – *"diṭṭhadhamma-sukha,"* happiness in this very life. Hereafter (in future lives, if one hasn't finished the path), the benefits are rebirth in good destinations, or meeting the Dhamma again easily, etc., due to the strong development of mind.

In summary, the practice of the four foundations of mindfulness confers extensive benefits: it purifies conduct, steadies the mind, dispels hindrances, fosters insight, and conduces to both mundane well-being (healthier mind, improved concentration, emotional balance) and spiritual well-being (progress on the path to *Nibbāna*). The Buddha taught that mindfulness of the body (*kāyagatā-sati*) brings much benefit and a great fruit[60], enumerating benefits like supernatural powers or final knowledge as possibilities. While not everyone will exhibit mystical powers, the core benefits – freedom from suffering and growth in wisdom – are accessible to all who practice. As a concluding note on benefits, the *Anguttara Nikāya* sums up that the four foundations of mindfulness, when cultivated, make much merit, create a great benefit, and lead to great security from bondage. The phrase "security from bondage" (*yogakkhema*) is a synonym for *Nibbāna*, indicating the supreme benefit. Therefore, one could say the benefits range from the practical (a well-managed mind, a happier life) to the profound (unshakable liberation). Little wonder that the Buddha and generations of teachers have strongly encouraged *satipaṭṭhāna* – its benefits touch every aspect of the path and the person.

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[60] M III 89–99.

2.1.7 Insight Meditation Interviews by Meditation Masters

In contemporary *Theravāda* Insight Meditation (*Vipassanā*) traditions, especially those stemming from countries like Myanmar and Thailand, a distinctive feature of training is the regular meditation interview or reporting session between the practitioner and an experienced teacher (often a meditation master). These interviews are an integral part of intensive mindfulness meditation retreats, serving as a forum for yogis (meditators) to report their experiences in practicing the four foundations of mindfulness and to receive personalized guidance. While this practice of interviews is not explicitly detailed in the ancient *Pāli* canon, it has evolved as a skillful means within the Theravāda monastic and lay meditation lineages to ensure that the teachings on *satipaṭṭhāna* are correctly understood and applied by each individual. The literature and recorded teachings of masters show how these interviews function and how they connect to the *satipaṭṭhāna* practice.

In an insight meditation interview, the meditation master typically asks the meditator to describe their recent meditation experiences in a factual, specific manner. The student is encouraged to be candid and precise about what they observed in terms of body, feelings, mind, and dhammas. For example, a meditator might report: “During walking meditation, I noted the intentions and movements: intending, lifting, pushing, placing – I felt tension in the leg (a painful feeling) but noted it and it disappeared. In sitting, I observed the breath; the mind wandered into thoughts about the past, I noted ‘thinking, thinking’ and it ceased. Later, a feeling of sadness arose when a memory came; I observed it as impermanent and it passed.” The master, having deep experience in *Satipaṭṭhāna*, listens for key indicators of the student’s mindfulness, noting, and insight. They will assess which foundation of mindfulness the student is engaging (e.g. are they staying mostly with body and feelings? Are they recognizing states of mind and hindrances when they arise under dhammas?). The purpose of the interview is multifold: to give the student confidence that their experiences are normal, to correct any misunderstandings or errors in technique, to tailor instructions to the student’s current stage, and to prevent or resolve any difficulties (such as dullness, excessive effort, or emotional disturbances).

Great masters such as the late Mahāsi Sayādaw of Burma instituted a very systematic approach to interviews. In the Mahāsi tradition, meditators meet daily with the teacher or an assistant teacher. Mahāsi Sayādaw instructed meditators to report in a structured way: first describe what was observed, then how it was noted, and what happened to it. For instance, Sayādaw U Paṇḍita (a chief disciple of Mahāsi) guided students to "report your experience in three phases: one, identify what occurred; two, say how you noted it; and three, describe what you observed as a result."[61]. This methodical reporting ensures that the student is practicing the *satipaṭṭhāna* method correctly – they are not just philosophizing or mixing other techniques, but sticking to noting phenomena and their characteristics. The interview process itself becomes an extension of mindfulness practice, because the student must recollect with clarity (*sati*) and describe with comprehension (*sampajaññā*) their meditative experience. It also teaches them to evaluate their practice objectively, noticing where there were gaps in mindfulness or where defilements snuck in.

Meditation masters use the information from interviews to give targeted advice. For example, if a meditator reports frequent anger arising (an item under dhamma contemplation: the hindrance of ill-will), the teacher might advise practicing loving-kindness as a temporary supplement or noting more diligently the sensations in the body that accompany anger. If a student is experiencing rapture and joy, the teacher might encourage them but also remind them to note these as passing phenomena (to avoid attachment). Essentially, the teacher maps the student's report onto the *satipaṭṭhāna* practice and the stages of insight. The teacher might discern, "Ah, this student is at the stage of perceiving impermanence keenly (perhaps the 'knowledge of dissolution')," and then guide them through the often challenging phase that follows (where discomfort or fear can arise as everything seems to be breaking apart). Many masters, such as Mahāsi Sayādaw outline what experiences to expect as one's

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[61] Sayadaw U Paṇḍita, *In This Very Life*, tr. Venerable U Aggacitta, (Kandy: Buddhist Publication Society, 2007), p. 25.

mindfulness intensifies – and in interviews, they confirm these with students, giving reassurance.

The benefit of interviews is that they help prevent deviations and stagnation. Meditation is subtle, and one can inadvertently drift into either slackness or over-striving, or get caught in a particular phenomenon (say, a vision or a blissful state) and not progress. A skilled teacher, through dialogue, can detect these issues. For example, if a meditator is overly focused on a concept or doing excessive mental analysis rather than direct noting, the teacher will bring them back: *"*Stay with bare attention; don't intellectualize.*"* Or if a meditator reports very few observations, just blankness, the teacher might realize they are slipping into a dull state and instruct them to arouse more energy or apply a different object to refresh mindfulness.

Insight meditation masters often share in published talks or writings some typical Q&A from interviews. In the lineage of Mahāsi Sayādaw, one often finds advice such as: "If a vision of the Buddha arises, note 'seeing, seeing' until it fades; if you feel like crying, note 'sadness' or 'crying' without suppression." This personal tailoring helps meditators navigate experiences that texts alone might not prepare them for. It is also a continuation of the spirit of the commentarial tradition – just as ancient commentators guided readers on how to interpret and practice *satipaṭṭhāna*, modern teachers guide practitioners in real time.

The Master's experience allows practitioners to quickly diagnose issues that might take a lone meditator months of trial and error. In that sense, interviews by masters make the Four Foundations of Mindfulness training more efficient and more effective. Sayādaw U Paṇḍita[62] emphasizes that discussing one's meditation experiences with a teacher is essential because it ensures personalized guidance, clarifies misunderstandings, and sharpens awareness. Like tending to a plant, the teacher offers specific instructions based on the meditator's current condition. The structured interview process also reinforces mindfulness by encouraging precision, honesty, and

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[62] Sayadaw U Paṇḍita, *In This Very Life*, tr. Venerable U Aggacitta, pp. 22–26.

focused observation, thereby deepening the quality of the practitioner's insight. Thus, he states that ideally, meeting daily with one's teacher is itself a vital part of the meditation practice.

In summary, meditation interviews with masters serve as a living extension of the *satipaṭṭhāna* teaching. They ensure the teachings are transmitted in an individualized manner, preserving fidelity to *Theravāda* principles while addressing each meditator's unique mind-stream. These interviews highlight that *satipaṭṭhāna* is not an abstract doctrine but a practical training that sometimes requires course-corrections and encouragement. The masters, having trodden the path, use the interviews to steer the meditators through the rough terrain of insight. The result is that many more people successfully reap the fruits of mindfulness practice than if they were practicing entirely on their own. This teacher-student interactive format is reminiscent of how the Buddha himself would occasionally question his disciples about their spiritual practice, as seen in some suttas[63] where he checks their understanding and guides them.

Concluding Remarks

The integration of the Four Foundations of Mindfulness—contemplation of the body (*kāyānupassanā*), feelings (*vedanānupassanā)*, mind (*cittānupassanā*), and mental objects (*dhammānupassanā*)—as expounded in the *Satipaṭṭhāna Sutta* and *Mahāsatipaṭṭhāna Sutta*, offers a comprehensive framework for cultivating mindfulness. Compared to widely known mindfulness-based interventions (MBIs) such as MBSR and MBCT, which often adapt Buddhist mindfulness concepts for secular settings, the FFMBI preserves the original layered structure taught by the Buddha. This methodical contemplation enables practitioners to develop deeper insight into the nature of body, mind, and phenomena, realizing things as they really are — characterized by impermanence (*anicca*), suffering or unsatisfactoriness (*dukkha*), and non-self or uncontrollability (*anattā*). The added value of FFMBI lies in its authenticity, systematic

[63] M I 115–118; M II 214–228; M III 1–7.

training across four domains, and its potential to foster both mental wellbeing and wisdom development in a more holistic way.

2.2 Salivary Cortisol

Cortisol is quantitatively the major glucocorticoid product of the adrenal cortex. The main reason to measure cortisol is to diagnose human disease which are caused by the overproduction of cortisol in Cushing's syndrome, deficiency of adrenal steroid excretion in Addison's disease and for therapy monitoring. Cortisol plays an important role in the regulation of many essential physiological processes, including energy metabolism, maintenance of electrolyte balance and blood pressure, immunomodulation and stress responses, cell proliferation as well as cognitive functions[64].

The hypothalamus secretes corticotropin-releasing hormone (CRH), which travels to the anterior pituitary gland and stimulates the secretion of adrenocorticotrophic hormone (ACTH). ACTH, inturn, is released into the blood stream and eventually reaches the adrenal cortex, where it stimulates the release of cortisol. This release of cortisol in response to an acute stress or is believed to be involved in promoting survival functions, such as increasing blood pressure and blood sugar levels and promoting analgesia, while concurrently conserving energy from non-vital functions by suppressing reproductive, immune and digestive functions. Salivary cortisol is an ultrafiltrate of plasma cortisol and reflects the levels of biologically active, non-protein bound cortisol in serum. It follows the circadian variation of serum cortisol, with the highest levels in the morning and lowest at midnight[65].

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[64] Gatti, R., Antonelli, G., Prearo, M., Spinella, P., Cappellin, E., & Palo, E. F., "Cortisol Assays and Diagnostic Laboratory Procedures in Human Biological Fluids", *Clinical Biochemistry*, Vol. 42, No. 12 (2009): 1205–1217.

[65] King, S. L., & Hegadoren, K. M., "Stress Hormones: How Do They Measure Up?", *Biological Research for Nursing*, Vol. 4 (2002): 92–103.

2.2.1 Salivary Cortisol Measurement

For salivary cortisol measurement is easy, non-invasive sample collection. By using the Salivette polyester swab device, which does not adsorb steroids, patients can collect saliva samples at home or in hospital. Salivary samples can be transferred to the laboratory during the following day. Salivary cortisol is stable at room temperature for 1-2 days and t refrigerator temperature for a week. Eating, smoking and brushing of the teeth should be avoided 2 hours before collection of saliva and the mouth should be rinsed with water 10-25 min before sampling. Salivary measurement may not be impossible in patients with oral diseases. Several techniques have been used to measure salivary cortisol. The most commonly used ones have been immunoassays, including in-house immunoassays and commercial cortisol assays, modified to improve sensitivity. Recently, LC-MS/MS (Liquid chromatography mass spectrometer) has provided promising results.[66]

2.2.2 Salivary Cortisol Levels

The salivary cortisol concentration is less than one tenth of that is serum and decreases to the low range during in late-night. Cortisol levels were described as follows. Morning salivary levels: normal range (0.094–1.551 µg/dL), below normal range (<0.094 µg/dL) and above normal range (>1.551 µg/dL). Bedtime salivary levels: normal range (not determined to 0.359 µg/dL) and above normal range (>0.359 µg/dL).[67] However, the reference range of salivary cortisol depends on studies or the usage of measurement's kit.

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[66] Turpeinen, U., & Hämäläinen, E., "Determination of Cortisol in Serum, Saliva and Urine", *Best Practice & Research Clinical Endocrinology & Metabolism*, Vol. 27, No. 6 (2013): 795–801.

[67] Aardal, E., & Holm, A. C., "Cortisol in Saliva—Reference Ranges and Relation to Cortisol in Serum", *Clinical Chemistry and Laboratory Medicine*, Vol. 33, No. 12 (1995): 927–932.

2.2.3 Salivary Cortisol as a Biomarker of Psychological Stress

Salivary cortisol has been increasingly utilized in the filed of stress hormone research as a measure of activation of the hypothalamic-pituitary-adrenal (HPA) axis, particularly in the setting of psychological stress related mental or physical diseases. The adrenal release of cortisol during the circadian slope and the stress response are under dual control of both ACTH and pregalionic sympathetic.[68] The studies assessing changes of the circadian slope as a measure of stress load may consider that light induces the expression of clock genes in the adrenal gland independent of ACTH release or the cortisol awakening response (CAR).

The repeated assessment of cortisol increases after awakening or CAR in saliva might represent a useful and easy to measure index of cortisol regulation.[69] In most studies, the CAR was observed to be an increase in salivary cortisol levels of about 50-75% within 30-45 min after awakening. The CAR is increasingly used in psychoneurodendocrinology as an indicator of HPA activity.[70] The best time to assess work-related stress is an awaking cortisol because the cortisol sample in saliva in the

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[68] Bornstein, S. R., Engeland, W. C., Ehrhart-Bornstein, M., & Herman, J. P., "Dissociation of ACTH and Glucocorticoids", *Trends in Endocrinology*, Vol. 19 (2008): 75–180.

[69] Pruessner, J. C., Wolf, O. T., Hellhammer, D. H., Buske-Kirschbaum, A., von Auer, K., Jobst, S., Kaspers, F., & Kirschbaum, C., "Free Cortisol Levels After Awakening: A Reliable Biological Marker for the Assessment of Adrenocortical Activity", *Life Sciences*, Vol. 61 (1997): 2539–2549.

[70] Clow, A., Thorn, L., Evans, P., & Hucklebridge, F., "The Awakening Cortisol Response: Methodological Issues and Significance", *Stress*, Vol. 7 (2004): 29–37.

morning has a low level of bias due to absence of any acute stressors upon awakening in the morning.[71]

The evaluation of cortisol and subjective pressure could assist to discover groups with impaired reaction to stress and increased cortisol stages.[72] Some study showed that workers who did not have stress had a significantly lower cortisol level than employees' group that might suffer from acute state of stress.[73] Salivary cortisol was shown to significantly decreases in stressed patients with interventions provide by health worker.[74] In addition, the salivary cortisol can be used as an additional examination in order to objectively check stress conditions in workers.[75]

For beneficial effects of meditation interventions for cortisol levels showed that the impact of a mindfulness-based stress reduction (MBSR) program on 21

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[71] MacDonald, D., & Wetherell, M. A., "Competition Stress Leads to a Blunting of the Cortisol Awakening Response in Elite Rowers", *Frontiers in Psychology*, Vol. 10, No. 7 (2019): 1–7.

[72] Bani-Issa, W., Radwan, H., Marzooq, F. A., Awar, S. A., Al-Shujairi, A. M., Samsudin, A. R., Khasawneh, W., & Albluwi, N., "Salivary Cortisol, Subjective Stress and Quality of Sleep Among Female Healthcare Professionals", *Multidisciplinary Healthcare*, Vol. 13, No. 2 (2020): 125–140.

[73] Amer, N., Monir, Z., Ibrahim, K. S., Tha, M. M., Shhy, E. M., & Saleh, M. S., "Assessment of Salivary Biomarkers on Work-Related Stress", *International Journal of Research in Environmental Science*, Vol. 4, No. 1 (2018): 56–61.

[74] Ornek, O. K., & Esin, M. N., "Effects of a Work-Related Stress Model Based Mental Health Promotion Program on Job Stress, Stress Reactions and Coping Profiles of Women Workers: A Control Groups Study", *2020*, Vol. 20, No. 1 (2020): 1658.

[75] Susoliakova, O., Smejkalova, J., Bicikova, M., Hodacova, L., Malkova, A., & Fiala, Z., "Assessment of Work-Related Stress by Using Salivary Cortisol Level Examination Among Early Morning Shift Workers", *Central European Journal of Public Health*, Vol. 26, No. 2 (2018)): 92–97.

participants receiving treatment for substance abuse in a residential therapeutic community and found that awakening salivary cortisol levels were significantly lower following the intervention.[76]

Concluding Remarks

Existing mindfulness interventions have shown promise in reducing cortisol levels, a key biomarker of stress. However, many studies lack consistency in mindfulness practice frameworks and often overlook the depth and structure of mindfulness training. Current approaches sometimes reduce mindfulness to relaxation techniques, limiting the transformative potential of practice. FFMBI addresses this gap by employing a disciplined, authentic Buddhist structure that systematically cultivates mindfulness, thus offering a theoretically grounded, methodical, and potentially more sustainable impact on biological stress markers such as salivary cortisol.

2.3 Body Composition

2.3.1 Body Composition Measurement in the Assessment of Health

To establish the nutrition and health status of an individual, knowledge of the complete representation of the anthropometric phenotype is necessary, that is, measurement of adiposity, lean mass, and bone. When measuring these discrete components, body composition research embraces a variety of methods that rely on particular assumptions that may not always hold true. The requirement for valid and accurate measurement of body composition has led to the emergence of new technologies, with improvements to differentiate the multiple components of human

[76] Marcus, M. T., Fine, P. M., Moeller, F. G., Khan, M. M., Pitts, K., & Swank, P. R., "Change in Stress Levels Following Mindfulness-Based Stress Reduction in a Therapeutic Community", *Addictive Disorders & Their Treatment*, Vol. 2 (2003): 63–68.

body composition. Finding a balance in a clinical setting between methods that are not only valid, accurate, and reliable but also practical and inexpensive is a challenge.[77]

Body composition should be considered to prevent disease development or progression and monitor treatment/intervention outcomes. Change in body composition due to dietary, exercise, and lifestyle interventions is of great importance to the decision-making process in nutritional care and the management of disease, aging, and rehabilitation. In response to the worldwide increase in preventable lifestyle conditions and non-communicable diseases, greater awareness of the health consequences associated with excessive deviation from "normal" has provided a stimulus to technological advances in the measurement of human body composition.

Common metrics, such as the body mass index (BMI), that purport to assess weight status are often cited as correlates of key health indicators of cardiovascular and metabolic disease. However, because BMI does not discriminate between adiposity and fat-free mass (FFM) or reflect the distribution of these components in the body, it tends to misclassify at the individual level and has low sensitivity to determine excess adiposity.[78]

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[77] Clodagh, C. M., Alexandra, C., Katie, K. H., Catherine, C. N., & Phil, P. J., "A Review of Body Composition Measurement in the Assessment of Health", *Topics in Clinical Nutrition*, Vol. 30, No. 1 (2015): 16–32.

[78] Okorodudu, D. O., Jumean, M. F., Montori, V. M., Corral, A. R., Somers, V. K., Erwin, P. J., & Jimenez, F. L., "Diagnostic Performance of Body Mass Index to Identify Obesity as Defined by Body Adiposity: A Systematic Review and Meta-Analysis", *International Journal of Obesity*, Vol. 34, No. 5 (2010): 791–799.

2.3.2 Models of Body Composition (2-3-4-C)

There are 3 Models of body composition including 2 (2-C), 3 (3-C), or 4 (4-C) components.[79] A 2-component (2-C) model of body composition divides the body into a body fat mass (BFM) component and an FFM component. Two-component methods such as hydrodensitometry or air displacement plethysmography assume a constant chemical composition and hence density of BFM and FFM. While these models have served the field of body composition assessment for more than 5 decades, these techniques can be demanding for the participant and can lead to inaccuracy if the "constant" proportions of water, mineral, and protein within FFM are invalidated, for example, if the constants do not apply to the study population or are changed by the treatment/therapy.

Three-component (3-C) models of body composition offer the advantage of differentiation of a third component, further dividing FFM into lean tissue mass (LTM) and bone mineral content (BMC). Dual-energy x-ray absorptiometry is a 3-C method that provides simultaneous body component measurement by the transmission of high- and low-energy x-rays through the body. It has enabled rapid, noninvasive assessment of whole-body composition that yields regional as well as wholebody values. Although reliable in its measurement, concern related to the validity of DXA stems from the assumption of constant hydration of the FFM component, that is, similar to that of a 2-C model

A 4-component (4-C) model of body composition is obtained by combining several measurement techniques to divide body mass into fat (measured by hydrodensitometry), mineral (measured by DXA), water (measured by isotope dilution), and protein (residual). A 4-C model is acknowledged as the true criterion method of reference of body composition, measuring the individual constituents of

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[79] Clodagh, C. M., Alexandra, C., Katie, K. H., Catherine, C. N., & Phil, P. J., "A Review of Body Composition Measurement in the Assessment of Health", *Topics in Clinical Nutrition*, Vol. 30, No. 1 (2015): 16–32.

FFM, rather than assuming a constant density of 1.100 g/cm3 and hydration of 0.73. However, the time and expense of using multiple measurement tools limit its application in a clinical setting or in large population studies.

2.3.3 Methods of Body Composition Measurement

The accuracy (or trueness) of a measurement is how close a result comes to the true value or criterion reference, whereas the precision of measurement is the degree to which repeated measurements under unchanged conditions show the same results. These properties are important for correct diagnosis or classification of aberrant body composition. There are available methods[80] in terms of clinometric properties, advantages, and disadvantages to facilitate evidence-based, clinical decisions, such as

Bioelectrical impedance analysis (BIA) involves the passing of a small electrical current through the body and measuring the resistance offered. This current is resisted or impeded to a different extent depending on the type of tissue, thereby differentiating between BFM and FFM. Most discrepancies tended to occur outside the "normal" body fat ranges (15%-25% in men, 25%- 33% in women). Therefore, the use of BIA in clinical practice may be considered less accurate in fat obese or low-fat athletic populations.

Anthropometry, specifically SF and girth measurement, is an indirect, prediction-based assessment of the percentage body fat of an individual (BF%). Skinfold thickness measurement is one of the most frequently used methods of determining adiposity due to its relative low cost and practicality. Precision or reliability of SF measures, assessed using technical error of measurement, is considered acceptable for interrater testing of less than 10% and intrarater testing of less than 5%.20 Using a calibrated anthropometric caliper, and in accordance with standardized procedures (eg, International Society for the Advancement of Kinanthropometry), SF thickness is measured most commonly from 3 (3SF; chest, abdominal, and thigh in men and triceps,

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[80] Ibid.

suprailiac, and thigh in women), 4 (4SF; biceps, triceps, subscapular, and suprailiac), or 7 (7SF; chest, axilla, triceps, subscapular, abdominal, suprailiac, and thigh) body sites.

Ultrasound studies, the use of B-mode ultrasonography for prediction of BF% is a method that offers certain advantages over anthropometry. Ultrasonography works by emitting an ultrasonic wave via a transducer probe placed on the skin, which is, in part, reflected by the fat-muscle interface. While an SF caliper causes deformation of the subcutaneous layer to produce a measurable fold, an ultrasound probe measures a single-layer construction and can distinguish adipose from dermal tissue with minimal deformation

2.3.4 Classification of Body Composition

Measuring body composition in humans is usually in response to the need to describe either deficiency or excess of a component that is thought, or known, to be related to health risk. It is important to consider the validity of the metric to define specific component(s) of body composition and the reference ranges of these components that classify/define relative risk or health status for example the obesity spectrum, sarcopenia, osteropenia/ osteroporosis.[81]

Concluding Remarks

Research linking mindfulness to changes in body composition (e.g., BMI, fat percentage) remains preliminary and often focuses narrowly on diet or exercise behaviors. Few interventions integrate mindfulness of the body (*kāyānupassanā*) as a direct meditative discipline. FFMBI directly engages body-awareness through its first foundation of mindfulness, systematically training individuals to observe bodily sensations and processes with equanimity. This approach addresses a critical gap by fostering not just behavioral change but deep body-mind awareness, potentially leading to more sustainable physical health improvements.

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[81] Ibid.

2.4 Blood Pressure and Pulse Rate

2.4.1 Blood Pressure and Pulse Rate Measurement

Blood pressure is the force of the blood pushing against the artery walls during contraction and relaxation of the heart. Each time the heart beats, it pumps blood into the arteries, resulting in the highest blood pressure as the heart contracts. When the heart relaxes, the blood pressure falls. Two numbers are recorded when measuring blood pressure. The higher number, or systolic pressure, refers to the pressure inside the artery when the heart contracts and pumps blood through the body.

The lower number, or diastolic pressure, refers to the pressure inside the artery when the heart is at rest and is filling with blood. Both the systolic and diastolic pressures are recorded as "mm Hg" (millimeters of mercury). For pulse rate is a measurement of the heart rate, or the number of times the heart beats per minute. As the heart pushes blood through the arteries, the arteries expand and contract with the flow of the blood. Taking a pulse not only measures the heart rate, but also can indicate the following: heart rhythm, strength of the pulse rate.

2.4.2 Blood Pressure and Pulse Rate Levels

There are two guidelines for blood pressure levels including, the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure.[82]

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[82] Chobanian, Aram V., M.D., *The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure*, U.S. Department of Health and Human Services, National Institutes of Health, National Heart, Lung, and Blood Institute, 2003, p. Xiii.

Normal	Systolic: less than 120 mm Hg
	Diastolic: less than 80 mm Hg
At Risk	Systolic: 120-139 mm Hg
(prehypertension)	Diastolic: 80-89 mm Hg
High Blood Pressure	Systolic: 140 mm Hg or higher
(hypertension)	Diastolic: 90 mm Hg or higher

For the American College of Cardiology/ American Heart Association Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults.[83]

Normal	Systolic: less than 120 mm Hg
	Diastolic: less than 80 mm Hg
Elevated	Systolic: 120-129 mm Hg
	Diastolic: less than 80 mm Hg
High Blood Pressure	Systolic: 130 mm Hg or higher
(hypertension)	Diastolic: 80 mm Hg or higher

For pulse rate or heart rate level, the American Heart Association defines the normal sinus heart rate as between 60 and 100 bpm.[84]

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[83] Whelton, P. K., Carey, R. M., Aronow, W. S., Casey, D. E., Collins, K. J., Himmelfarb, C. D., et al., "Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines", *Journal of the American College of Cardiology*, Vol. 71, No. 19 (2018): 127–248.

[84] Mason, J. W., Ramseth, D. J., Chanter, D. O., Moon, T. E., Goodman, D. B., Mendzelevski, B., "Electrocardiographic Reference Ranges Derived from 79,743 Ambulatory Subjects", *Journal of Electrocardiology*, Vol. 40 (2007): 228–234.

Concluding Remarks

While several mindfulness-based studies show reductions in blood pressure and pulse rate, many focus narrowly on stress management without systematically addressing the interrelation between body, feelings, mind, and phenomena. FFMBI, by integrating the full *Satipaṭṭhāna* practice, cultivates a deeper regulation of both physiological and psychological domains, offering a more comprehensive method for addressing autonomic system balance. This highlights FFMBI's added contribution to cardiovascular health interventions.

2.5 Brain Waves

2.5.1 Non-invasive Functional Neuroimaging: EEG

Electroencephalography (EEG) is a graphic representation of the difference in voltage between two different cerebral locations plotted over time. The scalp EEG signal generated by cerebral neurons is modified by electrically conductive properties of the tissues between the electrical source and the recording electrode on the scalp, conductive properties of the electrode itself, as well as the orientation of the cortical generator to the recording electrode.[85]

EEG is prominently used in biomedical applications for the detection of neurological disorders such as epilepsy, tumors, sleep disorders, and inflammation or damage in the brain. In addition to this, EEG is extensively used in neuroscience research focused on, but not limited to, motor, cognitive, and sensory imaging. Advances in neuroscience research have enabled the development of braincomputer interfaces, which facilitate the control and use of devices via brain wave interpretation. The EEG data collection process is typically centered around particular frequencies depending on the specific ap- plication, such as a research problem or medical assessment.

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[85] Olejniczak, P., "Neurophysiologic Basis of EEG", *Clinical Neurophysiology*, Vol. 23 (2006): 186–189.

Collection of EEG data through electrode placement adheres to internationally agreed rules, generally classified into 10-10 or 10-20. The numbers refer to the distance between electrodes; in the 10-20 system, for instance, electrodes are 10% of the skull's left-right distance and 20% of its front-back distance apart. The placement starts with initial marks at four points: between the forehead and nose, middle of the back of the skull over the occipital area, and on both sides of the head above the outer part of the ear opening. After the indentation, the electrodes are placed at specific distances from the points. The brain signals can be localized by narrowing down the region through the addition of electrodes.[86]

2.5.2 Levels of Brain Waves

A healthy human EEG will show certain patterns of activity that correlate with how awake a person is. Several studies have shown that brain waves in the 0-30 Hz range and amplitudes will vary between 20 and 100 μV. The observed frequencies are subdivided into various groups. Brain waves of specific frequencies, such as: delta (0.5–3 Hz) represents dreamless sleep, human growth hormone released, deep, trance-like, non-physical state, loss of body awareness. The theta (4–7 Hz) represents dreaming sleep (REM sleep), increased production of catecholamines (vital for learning and memory), increased creativity, integrative, emotional experiences, potential change in behavior, increased retention of learned material, hypnagogic imagery, trance, deep meditation, access to unconscious mind.

The alpha (8–13 Hz) represents relaxation, super-learning, relaxed focus, light trance, increased serotonin production, pre-sleep, meditation. The beta (13–30 Hz) represents concentration, arousal, alertness, cognition, higher levels associated with

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[86] K Liu, K. K. L., Bartsch, R. P., Lin, A., Mantegna, R. N., & Ivanov, P. C., "Plasticity of Brain Wave Network Interactions and Evolution Across Physiologic States", *Frontiers in Neural Circuits*, Vol. 9 (2015): 62.

anxiety, disease, feelings of separation.[87,88]Alpha waves are found in meditation and relaxation, while beta waves imply stress, excessive concentration, and anger.[89] Recently, it has been suggested that increases in alpha waves and decreases in beta waves are associated with improved cognitive performance, enhanced learning, and memory retention. [90,91]

Concluding Remarks

Current research on meditation and brainwaves often lacks standardization regarding meditation techniques, leading to variability in findings. Few studies explicitly train practitioners across the four mindfulness foundations systematically. FFMBI uniquely structures meditation to cultivate attentional stability, emotional

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[87] Oh, H.-J., & Song, G.-B., "Effects of Neurofeedback Training on the Brain Wave of Adults with Forward Head Posture", *Journal of Physical Therapy Science*, Vol. 28, No. 10 (2016): 2938–2941.

[88] Kang, S.-H., Kim, J.-H., Kim, I.-K., So, W.-Y., & Sung, D. J., "The Effect of Smoking on Brain Wave Activity in Middle-Aged Men Measured by Electrocorticography", *Iranian Journal of Public Health*, Vol. 44, No. 9 (2015): 1288–1290.

[89] Makada, T., Ozair, D., Mohammed, M., & Abellanoza, C., "Enhancing Memory Retention by Increasing Alpha and Decreasing Beta Brainwaves Using Music", *Proceedings of the 9th ACM International Conference on Pervasive Technologies Related to Assistive Environments*, Corfu Island, Greece (2016): 1–4.

[90] Keune, P. M., Hansen, S., Weber, E., Zapf, F., Habich, J., Muenssinger, J., Wolf, S., Schonenberg, M., & Oschmann, P., "Exploring Resting-State EEG Brain Oscillatory Activity in Relation to Cognitive Functioning in Multiple Sclerosis", *Clinical Neurophysiology: Official Journal of the International Federation of Clinical Neurophysiology*, Vol. 128, No. 9 (2017): 1746–1754.

[91] Young, S. N., "Biologic Effects of Mindfulness Meditation: Growing Insights into Neurobiologic Aspects of the Prevention of Depression", *Journal of Psychiatry & Neuroscience*, Vol. 36, No. 2 (2011): 75–77.

regulation, and insight across all four domains, which may produce more consistent and replicable changes in alpha/beta, ratio brainwave patterns. This systematic approach positions FFMBI to contribute more rigorously to neuroscientific understanding of mindfulness.

2.6 Relevant Research

The effects of mindfulness-based interventions on various physiological and psychological variables have been widely studied in the literature. Numerous studies have explored the impact of mindfulness practices on salivary cortisol levels, body composition, blood pressure, pulse rate, and brain waves, providing valuable insights into the potential benefits of such interventions. This review examines key studies that are relevant to the research topic of "Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners."

2.6.1 Four Foundations of Mindfulness

The concept of the Four Foundations of Mindfulness, referred to as "*cattaro satipaṭṭhānā*" in *Pāli*.[92] There are four foundations of mindfulness in the *Satipaṭṭhāna sutta*[93]: Mindful contemplation of the body (*Kāyānupassanā Satipaṭṭhāna*), Mindful contemplation of feeling (*Vedanānupassanā Satipaṭṭhāna*), Mindful contemplation of states of mind (*Cittānupassanā Satipaṭṭhāna*), and Mindful contemplation of mind-objects (*Dhammā-nupassanā Satipaṭṭhāna*).

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[92] Bhadantācariya Buddhaghosa, *The Path of Purification (Visuddhimagga)*, tr. Bhikkhu Ñāṇamoli, (Kandy: Buddhist Publication Society, 2010), p. 1.

[93] M I 55–63.

The definitions of each Foundations of Mindfulness (*satipaṭṭhāna*) are defined as follows[94]:

1. Mindfulness of the body (*kāyānupassanā satipaṭṭhāna*) - mindfulness limited to the investigation of the body (*kāyā*) as the field of thought (*ārammaṇa*), thus: "This body is just body, it is not a being, a person, or the self, of oneself or others." This is called *kāyānupassanā*.

2. Mindfulness of feeling (*vedanānupassanā*) - mindfulness limited to the investigation of feeling (*vedanā*)-including *sukha, dukkha*, and neither *sukha* nor *dukkha* as the field of thought, thus: "This feeling is just feeling, it is not a being, a person, or the self, of oneself or others." This is called *vedanānupassanā*.

3 Mindfulness of the nature of the mind - mindfulness limited to the investigation of the heart, which is tainted and stained or pure and clean, as the field of thought, thus: "This heart is just the heart, it is not a being, a person, or the self, of oneself or others." This is called *cittānupassanā*.

4 Mindfulness of mind-objects - mindfulness limited to the investigation of dhammas, which are *kusala* (good) or *akusala* (bad) and which arise from the heart as the field of thought, thus: "These dhammas are just dhammas, they are not a being, a person, or the self, of oneself or others." This is called *dhammānupassanā*.

The Practice of the Four Foundation of Mindfulness focuses on the body, feelings, mind and objects of the mind. These Four Foundations serve as a basis to cultivate mindfulness and awareness. These practices were expounded by the Buddha as the only one way to attain purification, the exclusive means to transcend the

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[94] Somdet Phra Maha Samana Chao Krom Phraya Vajirananavarorasa, *Navakovadā: Instructions for Newly-ordained Bhikkhus and Samaneras*, (Bangkok: Mahamakutaraja-vidyalaya, 1971), pp. 47–48.

sufferings of existence, and the one path towards achieving *Nibbāna* as stated in *Dīghanikāya*[95]:

The one and only path, Bhikkhus leading to the purification of beings, to passing far beyond grief and lamentation, to the dying-out of ill and misery, to the attainment of right method, to the realization of Nirvana, is that of the Fourfold Setting up of Mindfulness.

Somdet Phra Buddhaghosacariya (P. A. Payutto)[96] stated that the cultivation of the Four Foundations of Mindfulness is a very popular and revered method of Dhamma practice. It is considered to incorporate both tranquillity meditation (*samatha*) and insight meditation (*vipassanā*). A practitioner may develop tranquillity until the attainment of *jhāna* before developing insight based on the Four Foundations of Mindfulness and reaching the final goal. Alternatively, he or she may develop insight (again, based on the Four Foundations of Mindfulness) as the principal form of meditation, relying on only a basic level of concentration, just as much as is necessary for the task, and then reach the final goal.

Insight meditation (*vipassanā*) is a vital principle of Buddhist practice, which, though widely discussed, is also widely misunderstood. The following examination of the Foundations of Mindfulness (*satipaṭṭhāna*), however brief, will shed some light on the meaning of *Vipassanā*, including its essential attributes, its range of application, and its versatility, as well as the possibilities and benefits of practising insight meditation in everyday life.

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[95] D II 290.

[96] Bhikkhu P.A. Payutto, *Buddhadhamma, The Law of Nature and Their Benefits to Life*, (Bangkok: Buddhadhamma Foundation, 2018), pp. 1341–1342.

The Four Foundations of Mindfulness are outlined as follows:

1. *Kāyānupassana*: contemplation of the body; mindfulness of the body:

1.1 Mindfulness of breathing (*ānāpānasati*): going to a secluded place, sitting in a suitable posture for meditation, establishing mindfulness, and focusing on various aspects of the in- and out-breathing.

1.2 Mindfulness of posture (*iriyāpatha*): clearly perceiving the present 'mode' or posture of the body, say of standing, walking, sitting, or lying down.

1.3 Clear comprehension (*sampajañña*): maintaining clear comprehend-sion in every activity, e.g.moving forward, looking around, stretching out the arms, dressing, drinking, eating, chewing, urinating, defecating, waking up, going to sleep, speaking, and remaining silent.

1.4 Meditation on the repulsive (*paṭikkula-manasikāra*): contemplating the body, from the top of the head to the soles of the feet, as a repository of various unattractive constituents.

1.5 Meditation on the elements (*dhātu-manasikara*): contemplating the body by considering it separated into its four constituent elements.

1.6 Nine cemetery contemplations (*nava-sīvathika*): looking at corpses in nine different stages of decay, from one newly dead to one reduced to crumbling bones. In each case, one reflects that one's own body must meet a similar fate.

2. *Vedanānupassanā*: mindfulness of feeling (*vedanā*; sensation): when a feeling of pleasure or pain or a neutral feeling arises, whether dependent on material things (*sāmisa*) or independent of material things (*nirāmisa*), one perceives it clearly, as it actually exists in that moment of occurrence.

3. *Cittānupassanā*: mindfulness of the nature of the mind; insight into the state of the mind in any given moment. For example, one perceives clearly whether the mind is lustful or free from lust, angry or free from free from anger, deluded or free from delusion, agitated or concentrated, liberated or fettered, etc.

4. *Dhammānupassanā*: mindfulness of mind-objects:

4.1 Hindrances (*nivaraṇa*): clearly perceiving, in each moment, whether any of the five hindrances are present in the mind or not; clearly perceiving how as-yet unarisen hindrances arise, how hindrances already arisen may be abandoned, and how abandoned hindrances may be prevented from arising again.

4.2 Aggregates (*khandha*): clearly understanding the five aggregates; knowing the nature of each aggregate; knowing how each aggregate arises and how it ceases.

4.3 Sense spheres (*āyatana*): clearly understanding each of the six internal sense bases and the six external sense objects; understanding the mental fetters (*saṃyojana*) which arise dependent on the sense spheres; knowing how unarisen fetters arise, how arisen fetters may be abandoned, and how abandoned fetters may be prevented from arising again.

4.4 Enlightenment factors (*bojjhanga*): clearly understanding, in each moment, whether any of the seven factors of enlightenment are present in the mind or not; knowing how unarisen enlightenment factors arise, and knowing how arisen factors can be brought to completion.

4.5 Noble truths (*ariya-sacca*): clearly perceiving the nature of the Four Noble Truths.

The Most Venerable Mahasi Sayadaw Akamaha Pandita Bussabana[97], *Vipassanā* Meditation Master gave a basic meditation instruction that the practice of the Four Foundation of Mindfulness, alternatively referred to as *Vipassanā* or Insight Meditation is the effort made by the meditator to correctly understand the nature of the psycho-physical phenomena, taking place in his own body. Physical phenomena are the things or objects which one clearly perceives around one. The whole of one's body that

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[97] Venerable Mahasi Sayadaw, *Basic Meditation Instruction*, (Bangkok: Canna Graphic Limited Partnership, 2004), p. 1.

one clearly perceives constitutes a group of material qualities, *Rūpa*. Psychical or mental phenomena are acts of consciousness or awareness, *Nāma*. These *Nāma-rūpa* are clearly perceived to be happening whenever they are seen, heard, smelled, tasted, touched, or thought of. We must make ourselves aware of them by observing them and noting thus: "seeing – seeing", "hearing – hearing", "smelling – smelling", "tasting – tasting", "touching – touching", or "thinking – thinking". Every time one sees, hears, smells, tastes, touches, or thinks, one should make a note of that fact. But in the beginning of one's practice, one cannot make a note of every one of these happenings. One should therefore begin with noting those happenings, which are conspicuous and easily perceivable.

2.6.2 Mindfulness and Salivary Cortisol Levels

The effects of mindfulness-based interventions on salivary cortisol levels have been a topic of interest in research. Several studies have examined the relationship between mindfulness practices and cortisol levels, shedding light on the potential benefits of mindfulness in stress reduction. Creswell, et al.[98] investigated the effects of a brief mindfulness meditation training on cortisol responses to a social stress task. The results indicated that participants who received mindfulness training showed lower cortisol responses compared to those in the control group, suggesting that mindfulness meditation may buffer the impact of stress on cortisol levels.

Moreover, Jacobs, T. L. et al.[99] examined the effects of intensive meditation training on various physiological markers, including salivary cortisol levels. The results revealed that individuals who underwent the meditation training showed decreased

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[98] Creswell, J. D., Pacilio, L. E., Lindsay, E. K., & Brown, K. W., "Brief Mindfulness Meditation Training Alters Psychological and Neuroendocrine Responses to Social Evaluative Stress," *Psychoneuroendocrinology*, Vol. 44 (2014): 1–12.

[99] Jacobs, T. L., Epel, E. S., Lin, J., Blackburn, E. H., Wolkowitz, O. M., Bridwell, D. A., & Saron, C. D., "Intensive Meditation Training, Immune Cell Telomerase Activity, and Psychological Mediators," *Psychoneuroendocrinology*, Vol. 36, No. 5 (2011): 664–681.

cortisol levels compared to the control group. This finding suggests that mindfulness practices can modulate stress response and lead to lower cortisol levels. Similarly, Jaremka et al.[100] found that mindfulness-based stress reduction programs resulted in lower cortisol responses to stress.

2.6.3 Mindfulness and Body Composition

A randomized controlled trial study by Rogers, J. M. et al.[101] investigated the effects of mindfulness training on body composition, eating behavior, and psychological well-being in obese individuals. The findings indicated that participants who underwent the mindfulness training showed improvements in body composition measures, including reductions in body weight, BMI, and waist circumference. Additionally, improvements were observed in eating behaviors and psychological well-being. This study suggests that mindfulness training may be beneficial for managing body composition and promoting overall well-being in obese individuals.

Additionally, Mason, A. E. et al.[102] investigated the effects of a mindfulness-based diet and exercise intervention on weight loss and body composition. The findings revealed that participants who received the intervention demonstrated significant reductions in body weight, BMI, and body fat percentage compared to the control group.

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[100] Jaremka, L. M., Fagundes, C. P., Peng, J., Bennett, J. M., Glaser, R., Malarkey, W. B., & Kiecolt-Glaser, J. K., "Loneliness Promotes Inflammation During Acute Stress," *Psychological Science*, Vol. 24, No. 7 (2013): 1089–1097.

[101] Rogers, J. M., Ferrari, M., Mosely, K., Lang, C. P., Brennan, L., & Gunn, R., "The Effect of Mindfulness Training on Body Composition, Eating Behavior, and Psychological Well-Being: A Randomized Controlled Trial In Obese Individuals," *Obesity Science & Practice*, Vol. 3, No. 3 (2017): 315–324.

[102] Mason, A. E., Epel, E. S., Aschbacher, K., Lustig, R. H., Acree, M., Kristeller, J., & Daubenmier, J., "Reduced Reward-Driven Eating Accounts for The Impact Of A Mindfulness-Based Diet And Exercise Intervention on Weight Loss: Data From The SHINE Randomized Controlled Trial," *Appetite*, Vol. 100 (2016): 86–93.

The study also found that reductions in reward-driven eating behaviors mediated the relationship between intervention and weight loss. These findings suggest that mindfulness-based interventions targeting eating behaviors can contribute to improvements in body composition.

Moreover, a previous review article explored the impact of mindfulness approaches on weight loss, weight maintenance, and weight regain. It examined various mindfulness-based interventions, including mindfulness-based eating awareness training (MB-EAT) and mindfulness-based stress reduction (MBSR). The study highlighted the potential of mindfulness interventions in promoting weight loss, supporting weight maintenance, and reducing the risk of weight regain. While the article did not focus specifically on body composition, it emphasized the role of mindfulness in facilitating healthier eating behaviors and psychological well-being, which can indirectly influence body composition. [103]

In addition, Parvan, K. et al.[104] conducted a systematic review and meta-analysis that analyzed the effects of mindfulness-based interventions on weight loss and body composition. The study included a comprehensive analysis of various mindfulness interventions, such as mindfulness-based stress reduction (MBSR) and mindfulness-based cognitive therapy (MBCT). The findings revealed a significant association between mindfulness-based interventions and improvements in body composition measures, including reductions in body weight, BMI, and waist circumference.

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[103] Dunn, C., Haubenreiser, M., Johnson, M., Nordby, K., Aggarwal, S., Myer, S., & Thomas, C., "Mindfulness Approaches and Weight Loss, Weight Maintenance, and Weight Regain," *Current Obesity Reports*, Vol. 7, No. 1 (2018): 37–49.

[104] KParvan, K., Heshmati, R., Tavakoli, S., Mirmiran, P., Azizi, F., & Eslami, B., "Effects of Mindfulness-Based Interventions on Weight Loss and Body Composition: A Systematic Review and Meta-Analysis," *Obesity Medicine*, Vol. 19 (2020): 100253.

2.6.4 Mindfulness and Blood Pressure and Pulse Rate

The following review provides an overview of recent literature and research studies investigating the relationship between mindfulness practice or mindfulness-based interventions or meditation and blood pressure and pulse rate. Hilton, L. et al.[105] carried out a systematic review and meta-analysis that examined the effects of meditation on posttraumatic stress disorder (PTSD) symptoms, including blood pressure and heart rate. The study included various forms of meditation, such as mindfulness meditation, transcendental meditation, and loving-kindness meditation. The findings suggested that meditation interventions were associated with significant reductions in blood pressure and heart rate, indicating potential benefits for cardiovascular health.

Similar to a previous systematic review and meta-analysis by Pascoe, M. C. et al.[106] They investigated the role of mindfulness in mediating physiological markers of stress, including blood pressure and heart rate. The study examined various mindfulness-based interventions, such as mindfulness-based stress reduction (MBSR) and mindfulness-based cognitive therapy (MBCT). The findings demonstrated that mindfulness interventions were associated with significant reductions in blood pressure and heart rate, indicating their potential in reducing physiological stress responses.

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[105] Hilton, L., Maher, A. R., Colaiaco, B., Apaydin, E., Sorbero, M. E., Booth, M., & Shekelle, P. G., "Meditation for Posttraumatic Stress: Systematic Review and Meta-Analysis," *Psychological Trauma: Theory, Research, Practice, and Policy*, Vol. 9, No. 4 (2017): 453–460.

[106] Pascoe, M. C., Thompson, D. R., Jenkins, Z. M., & Ski, C. F., "Mindfulness Mediates the Physiological Markers of Stress: Systematic Review and Meta-Analysis", *Journal of Psychiatric Research*, Vol. 95 (2017): 156–178.

Furthermore, Zhang, J. et al.[107] conducted systematic review and meta-analysis that focused on the effects of mindfulness-based stress reduction (MBSR) on perceived stress and psychological health in patients with tension-type headaches. While the study primarily examined psychological outcomes, it also considered physiological markers such as blood pressure and heart rate. The findings indicated that mindfulness-based interventions were associated with significant reductions in perceived stress and improvements in psychological well-being, potentially influencing physiological parameters such as blood pressure and heart rate.

2.6.5 Mindfulness and Brain Waves

The following review provides an overview of recent literature and research studies examining the relationship between mindfulness practice, mindfulness-based interventions, or meditation, and brain waves, shedding light on the neurophysiological effects and potential benefits of these practices on brain functioning. Cahn, B. et al.[108] carried out comprehensive review article provides an overview of various studies investigating the effects of meditation on brain waves using electroencephalography (EEG), event-related potentials (ERP), and neuroimaging techniques. The review highlights the impact of different meditation practices on brain wave patterns, including increases in alpha and theta waves, which are associated with relaxed and focused states of consciousness.

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[107] Zhang, J., Liu, X., Xie, X., Liu, L., & Wu, Y., "Effects of Mindfulness-Based Stress Reduction on Perceived Stress and Psychological Health in Patients with Tension–Type Headache: A Systematic Review and Meta-Analysis", *Journal of Clinical Nursing*, Vol. 29, No. 11–12 (2020): 1759–1774.

[108] Cahn, B. R., & Polich, J., "Meditation States and Traits: EEG, ERP, and Neuroimaging Studies", *Psychological Bulletin*, Vol. 145, No. 5 (2019): 530–562.

Moreover, a previous study by Zeidan, F. al.[109] investigated the neural correlates of mindfulness meditation-related anxiety relief using functional magnetic resonance imaging (fMRI) and EEG. The findings revealed that mindfulness meditation was associated with increased activation in brain regions involved in attentional control and emotional regulation, as well as a reduction in anxiety. The study provides insights into the underlying brain mechanisms associated with the anxiety-reducing effects of mindfulness practice. A prior study on mantra meditation[110] showed the effects of repetitive speech, similar to mantra meditation, on brain activity using fMRI. The findings demonstrated widespread deactivation across the cortex during repetitive speech, suggesting a state of reduced cognitive engagement and increased relaxation. The study provides evidence for the neural effects of repetitive speech, which is commonly used in mindfulness and meditation practices.

Concluding Remarks

Although many mindfulness-based interventions demonstrate benefits, existing research often adapts Buddhist mindfulness in secularized forms, omitting critical dimensions such as deep contemplation on mental objects (*dhammas*) or systematic development of insight. FFMBI fills this gap by preserving the integrity of the original Buddhist mindfulness system while translating it into a practical intervention. It builds upon previous mindfulness studies but deepens the theoretical and experiential foundations, offering a new model that bridges authentic mindfulness with measurable outcomes.

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[109] Zeidan, F., Martucci, K. T., Kraft, R. A., McHaffie, J. G., & Coghill, R. C., "Neural Correlates of Mindfulness Meditation-Related Anxiety Relief", *Social Cognitive and Affective Neuroscience*, Vol. 9, No. 6 (2014): 751–759.

[110] Berkovich-Ohana, A., Wilf, M., Kahana, R., Arieli, A., & Malach, R., "Repetitive Speech Elicits Widespread Deactivation in the Human Cortex: The 'Mantra' Effect?", *Brain and Behavior*, Vol. 5, No. 9 (2015): e00346.

Theoretical Synthesis

The literature reviewed across physiological, psychological, and neuroscientific fields demonstrates that mindfulness interventions can benefit mental and physical health. However, significant gaps persist in terms of depth, authenticity, and systematic training. Many existing interventions simplify mindfulness into relaxation or attention techniques, neglecting the comprehensive training outlined in early Buddhist texts.

The Four Foundations of Mindfulness-Based Intervention (FFMBI) is designed to fill these gaps. By structuring training according to *the Satipaṭṭhāna and Mahāsatipaṭṭhāna Suttas*, FFMBI offers an integrated, methodical development of mindfulness. It explicitly trains contemplation of body, feelings, mind, and mental phenomena, preserving both the breadth and depth of classical mindfulness practice.

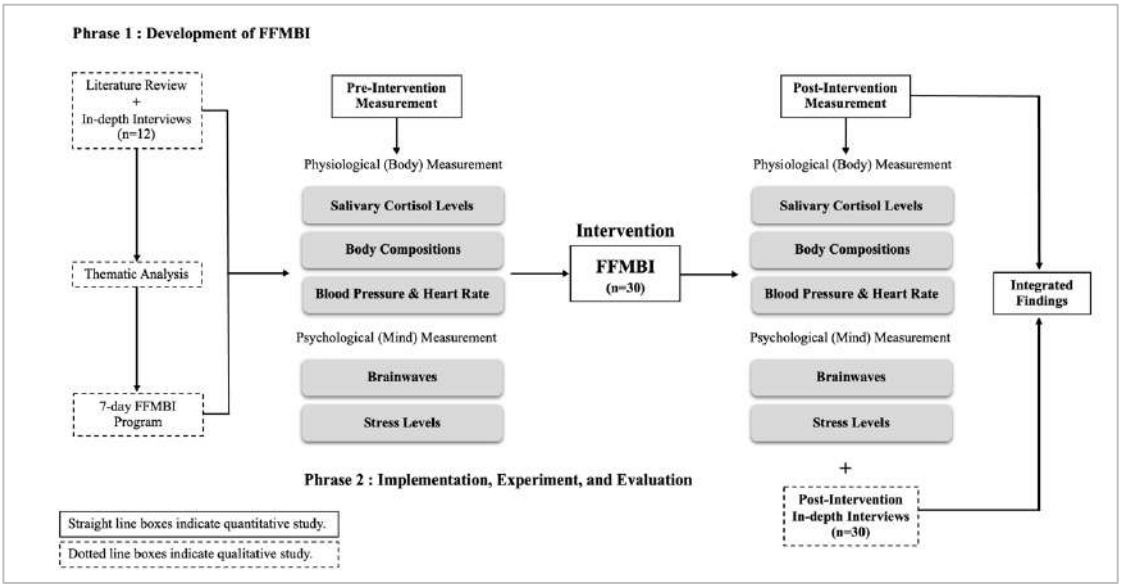
Furthermore, FFMBI innovates by measuring its impact on biological, psychological, and cognitive markers, including salivary cortisol, body composition, blood pressure, pulse rate, brainwave patterns, and stress perception. This multifaceted evaluation grounds the intervention in both the timeless teachings and wisdom of the Buddha and modern scientific inquiry.

Thus, FFMBI contributes new knowledge by integrating authentic Buddhist mindfulness frameworks into modern intervention models, offering a more holistic, systematic, and theoretically grounded method of enhancing mental wellbeing. It represents a novel synthesis between traditional contemplative sciences and contemporary evidence-based health sciences.

2.7 Conceptual Framework

The conceptual framework for this study is based on a mixed-methods research design, integrating both qualitative and quantitative approaches. The research is structured in two main phases as shown in Figure 2.17:

Figure 2.17 Conceptual Framework



In Phase 1, the Four Foundations of Mindfulness-Based Intervention (FFMBI) program was developed through a literature review of primary Buddhist scriptures (*Tipiṭaka*) and in-depth interviews with 12 *Vipassanā* Meditation Masters and Buddhist scholars. The qualitative data obtained underwent thematic analysis to extract key principles and practices essential for the FFMBI program. These insights were synthesized to create a structured 7-day FFMBI retreat program.

In Phase 2, the FFMBI program was implemented and evaluated through experimental methods. Pre- and post-intervention measurements were collected to assess both physiological (body) and psychological (mind) outcomes. Physiological measurements included salivary cortisol levels, body compositions (e.g., body weight, BMI, body fat percentage, visceral fat), blood pressure, and pulse rate. Psychological measurements encompassed brainwave activity (alpha/beta ratios) and stress levels using the Suanprung Stress Test 20 (SPST-20).

After the intervention, participants' experiences were further explored through post-intervention in-depth interviews to gather qualitative data. Finally, integrated findings were derived by combining the results from both the quantitative and qualitative studies, offering a comprehensive understanding of the FFMBI's effects on practitioners' physiological and psychological well-being. This framework clearly demonstrates the interconnectedness between the qualitative development of the intervention and the quantitative assessment of its outcomes.

Chapter 3

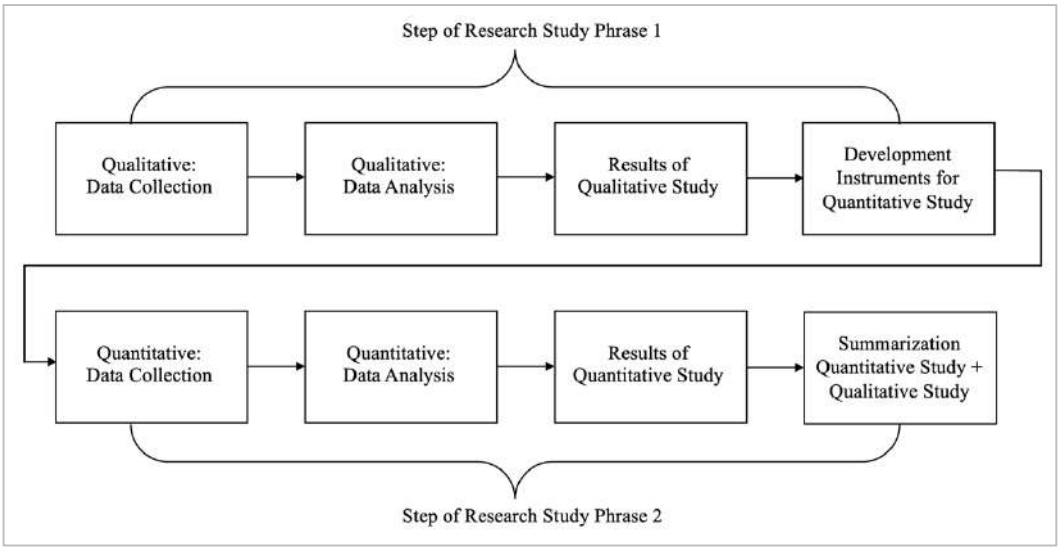
Research Methodology

This research employed a mixed-methods research design to comprehensively explore the impact of the FFMBI intervention. The study is conducted in two distinct phases: Phase 1 adopted a qualitative research design, involving a thorough literature review and in-depth interviews to provide a foundational understanding of the Four Foundations of Mindfulness. This qualitative phase informed the development of FFMBI as a structured intervention. In Phase 2, a quantitative approach was employed to evaluate the physiological and psychological effects of the intervention through pre- and post-intervention measurements, complemented by qualitative insights gathered from follow-up interviews. The following sections outline the detailed research design and methodology, with specific emphasis on both the qualitative and quantitative components of the study.

3.1 Research Design

This study employed a mixed-methods research design, integrating both qualitative and quantitative research approaches. The research was organized into two phases: Phase 1 focused on the qualitative development of the Four Foundations of Mindfulness-Based Intervention (FFMBI), and Phase 2 emphasized its implementation, experimental intervention, and evaluation. As shown in Figure 3.1: Flow of Research Design, Phase 1 began with a qualitative study, involving a comprehensive Literature Review and In-depth Interviews, which informed the development of the FFMBI. Phase 2 proceeded with a combination of quantitative study, including Pre- and Post-Intervention Measures and an Experimental Intervention, followed by qualitative study in the form of Post-Intervention Interviews. This approach allowed for a comprehensive assessment of the FFMBI, obtaining both objective and subjective outcomes.

Figure 3.1 Flow of Research Design[1]



[1] Rattana Buasonte, *Mixed Methods in Research and Evaluation*, (Bangkok: Chulalongkorn University Printing, 2012), p. 115.

This mixed-methods study was executed in two sequential phases as shown in Table 3.1. Phase 1 generated the conceptual foundations of FFMBI through (i) a systematic documentary analysis of canonical and scholarly sources and (ii) in-depth interviews with subject-matter experts. Phase 2 implemented FFMBI with a practitioner cohort and evaluated its feasibility and effects using a one-group pretest–posttest design, supplemented by post-retreat interviews.

Table 3.1 Overview of the Mixed-Methods Research Design

Phrase	Purpose	Primary data sources	Dominant analytic lens
1	Develop FFMBI	(a) Buddhist texts & academic works; (b)expert interviews	Inductive thematic analysis
2	Implement & evaluate FFMBI	Physiological/psychological measurements; post-intervention interviews	Descriptive & inferential statistics + qualitative thematic synthesis

3.2 Phrase 1: Qualitative Research Method

3.2.1 Documentary Method — Systematic Literature Review

This method aimed to extract foundational concepts and practical applications of the Four Foundations of Mindfulness (*Satipaṭṭhāna*) from canonical and contemporary sources to inform the structure of the FFMBI. The details of the documentary method are outlined in Table 3.2.

Table 3.2 Documentary Method

Item	Details
Objective	To extract practice principles, schedule elements, and supportive/obstructive factors relating to the Four Foundations of Mindfulness (FFM) that would inform FFMBI design.
Data Sources	Primary sources: English translations of the *Pāli* Canon (e.g., *Dīgha Nikāya, Majjhima Nikāya*), *Visuddhimagga*, and *Satipaṭṭhāna* Commentary. Secondary sources: contemporary meditation manuals, peer-reviewed articles on FFM-based interventions.
Search Strategy	Databases and archives searched included *Pāḷi Tipiṭaka*, SuttaCentral, Scopus, JSTOR, PubMed) using Boolean strings: ("Four Foundations of Mindfulness" OR "*Satipaṭṭhāna*") AND (practice OR schedule OR intervention). Snowballing of reference lists was used to trace the Four Foundations of Mindfulness monastic practice manuals.
Inclusion Criteria	(i) English language; (ii) explicit discussion of at least one foundation of mindfulness and its practical implementation; (iii) full-text available.
Unit of Analysis	Sentence or paragraph conveying a discrete, practice-relevant content.
Coding & Thematic Development	Texts were inductively coded for recurring themes such as duration of practice, daily schedule, physical postures, and supplementary practices. Themes were extracted using qualitative thematic analysis and served as input for intervention design.

3.2.2 Interview Method — In-Depth Semi-Structured Interviews

In addition to the documentary analysis, in-depth semi-structured interviews were conducted to enrich the program development process with experiential knowledge from meditation masters and Buddhist scholars. This approach ensured that the FFMBI structure would not only reflect doctrinal authenticity but also practical feasibility from practitioners' perspectives. Key informants were carefully selected through purposive sampling, and interviews were audio/video recorded with participant consent to maintain data accuracy. The details of the interview method are outlined in Table 3.3 below:

Table 3.3 Interview Method

Item	**Details**
Objective	To collect experiential knowledge, insights, and recommendations regarding the optimal structure, duration, postures, and supportive practices for FFMBI.
Data Sources	12 key informants selected via purposive sampling: 6 *Vipassanā* meditation masters and 6 Buddhist scholars.
Inclusion criteria	Recognized expertise in the Four Foundations of Mindfulness; for *Vipassanā* meditation masters, at least 10 years of teaching experience in *Vipassanā* meditation; for Buddhist scholars, at least 5 years of teaching or research experience in the field of Buddhist Studies.
Screening result	All 12 key-informants met the criteria and agreed to participate.
Interview Topics	Duration and structure of intervention, balance of meditation postures, Dhamma talk inclusion, and factors supporting retreat success.
Unit of Analysis	Full transcriptions of 1–2 hour interviews, segmented into meaningful content units.

Table 3.3 Interview Method (Cont.)

Item	Details
Interview Process	All interviews were conducted face-to-face. Every interview was audio/video recorded with participant consent to ensure the fidelity of data collection. The recordings were later transcribed verbatim for thematic analysis. The interviews were conducted by the lead researcher, a scholar with a PhD in Buddhist Studies and an MA in Buddhist Psychology, as well as a dedicated practitioner with extensive experience in the Four Foundations of Mindfulness meditation. This background ensured an in-depth and contextually sensitive data collection process.
Coding & Thematic Development	A reflective thematic approach was employed, focusing on organic emergence of themes without imposing rigid coding structures. Key themes—such as the necessity of a 7-day minimum retreat, alternation between walking and sitting meditation, the critical role of daily Dhamma talks and individual meditation interviews, the practice of noble silence, abstention from mobile phone use, provision of a two-meal healthy, plant-based diet, and accommodation in individual residences—were identified and directly used to guide the FFMBI program design. Peer discussions were conducted to review and validate the thematic conclusions and ensure alignment with both doctrinal principles and practical effectiveness.

Integration of Phase 1 Findings

Themes derived from both the documentary analysis and key informant interviews were synthesized during a half-day analytic workshop involving the research team. This integration process informed the core design principles of the FFMBI pilot program. Several key structural decisions emerged: the intervention would follow a minimum 7-day retreat format to ensure sufficient time for physiological and psychological transformation; meditation sessions would alternate every 45 minutes between walking and sitting to balance physical movement and stillness; daily Dhamma talks and individual meditation interviews would be included to support deepening understanding and personalized guidance; and noble silence would be maintained throughout, with participants refraining from all forms of verbal and digital communication. The retreat would also require full abstention from mobile phone use and provide a standardized, plant-based meal schedule with two meals per day—served in the morning and before noon—to support mindfulness in eating and align with traditional monastic discipline. These integrated elements formed the operational blueprint of the FFMBI program as implemented and detailed in Appendix G.

3.3 Phrase 2: Quantitative + Qualitative Research Method

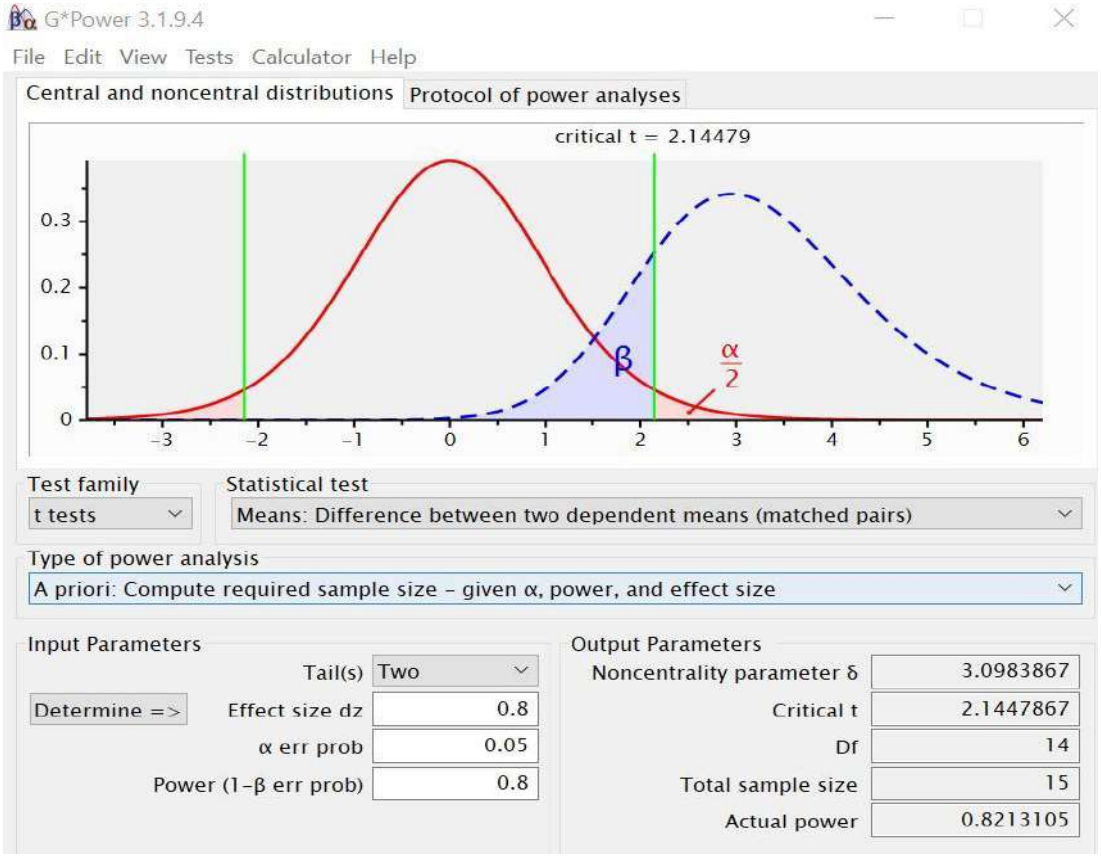
3.3.1 Population and Sampling

The study utilizes a quasi-experimental design to compare the effects of FFMBI on the targeted variables. It involves a pretest-posttest design, where measurements are taken before and after the intervention to assess changes within the same group of practitioners. This design allows for causal inferences while accounting for practical constraints. The sample of the study consists of participants who meet the inclusion criteria.

Sample Size

The minimum sample size for paired sample t-test analysis was calculated using G*Power software version 3.1.9.4 where the estimated effect size of 0.8, α value of 0.05 and power of 80% is assumed[2] The minimum sample size calculated was 15 which is increased to 30 to accommodate incomplete tests.

Figure 3.2 G*Power Software Version 3.1.9.4



The collected data in this study is subjected to rigorous statistical analysis, employing various measures of central tendency, including descriptive statistics such as percentages, means, and standard deviations. Furthermore, to investigate significant differences for One-group Pretest-Posttest Design, the t-test analysis technique is utilized as a statistical tool in this research.

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[2] Cohen, J., "The Effect Size Index: d," *Statistical Power Analysis for The Behavioral Sciences*, Vol. 2 (1988): 284–288.

This research collect data from a sample group comprising 30 participants who meet the inclusion criteria and can participate in the entire retreat, scheduled from July 8 to 15, 2024, at Wat Bhaddanta Asabharam, Chonburi Province. The sample group was selected based on the following inclusion criteria:

Inclusion Criteria

1. Voluntary participation in the project and signing a consent form after a thorough understanding of the experiment.

2. Thai nationality

3. Can participate in the entire retreat, scheduled from July 8 to 15, 2024, at Wat Bhaddanta Asabharam, 118/1 Moo 1, Ban Nong Pru, Tambon Nong Phai Kaeo, Amphoe Ban Bueng, Chonburi Province, Thailand.

4. Age of 20 years or older.

5. Having experience in practicing mindfulness according to the Four Foundations of Mindfulness at least once.

6. Ability to practice Walking and Sitting Meditation according to the Four Foundations of Mindfulness for a minimum of 30 minutes per session.

7. No chronic illnesses; good health.

8. No mental health issues.

9. No significant loss of a family member for more than 6 months.

Exclusion Criteria

1. Participants unwilling to provide voluntary consent and undergo a comprehensive understanding of the experiment.

2. Non-Thai nationality.

3. Inability to commit to the entire retreat scheduled from July 8 to 15, 2024, at Wat Bhaddanta Asabharam, 118/1 Moo 1, Ban Nong Pru, Tambon Nong Phai Kaeo, Amphoe Ban Bueng, Chonburi Province, Thailand.

4. Age below 20 years.

5. Lack of prior experience in practicing mindfulness according to the Four Foundations of Mindfulness.

6. Inability to engage in Walking and Sitting Meditation according to the Four Foundations of Mindfulness for a minimum of 30 minutes per session.

7. Presence of chronic illnesses or poor health.

8. History of mental health issues.

9. Experiencing significant loss of a family member within the past 6 months.

3.3.2 Research Instruments

In this study, research instruments will be employed to investigate the effects of the Four Foundations of Mindfulness-Based Intervention (FFMBI) on practitioners. These instruments will measure salivary cortisol levels, body composition, blood pressure, pulse rate, and brain waves using the Body and Mind Relaxation Measurement methodology developed by the Holistic Health and Medical Diagnostic Center within the Faculty of Medical Technology at Mahidol University (MUMT). The research instruments are categorized into two distinct measurement domains: body and mind, as follows:

Quantitative Research Instruments

1. Saliva Cortisol Test

Cortisol is a hormone that affects almost every organ and tissue in body. It helps body, respond to stress (cortisol is sometimes called the "stress hormone"), reduce inflammation, regulate blood sugar and metabolism, control blood pressure. Newsday, Cortisol is used in the assessment of adrenal, pituitary, and hypothalamic function, and it also important represents in stress-related hormones. In this study, salivary cortisol analysis will be measured on the Elecsys 2010 analyzer (Figure 3.3) which is a competitive polyclonal antibody immunoassay that employs a magnetic separation step followed by electrochemiluminescence quantitation.

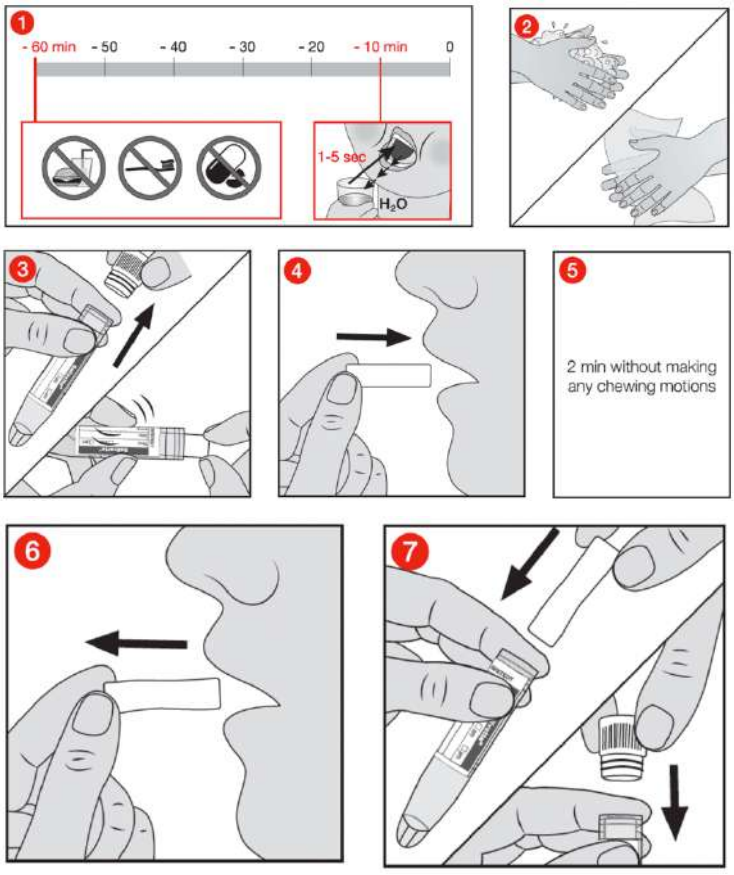
The participants will collect saliva immediately into diagnostic collection tube; Salivette tube upon awakening and before eating or brushing their teeth (Instructions emphasized that they should “*spit* clear saliva and try to minimize the

amount of mucous"). Following transport and perform the test at the laboratory, Medical Diagnostic Unit, Holistic Health and Medical Diagnostic Center within the Faculty of Medical Technology, which is an accredited laboratory complying with ISO 15189.

Figure 3.3 (a) Elecsys 2010 Automated Analyzer Tube (Salivette Tube), (b) Diagnostic Saliva Collection, and (c) Saliva Cortisol Sample Collection

(a)

(b)



(c)

2. Body Composition

Body composition analysis is a type of weighing scale that provides the user with a calculation of their body health. Body composition measurements include body fat, muscle mass, protein mass, metabolic rate, water, bone etc. Body composition is a universal term used in the health and fitness to find out the level of health. The participants will be measured body composition by Body Composition Analyzer: TANITA DC360 (Figure 3.5). This equipment provides estimated values for each measured value of body fat percentage, fat mass, fatfree mass, muscle mass and bone mass by the DXA method, estimated value for the total body water measured value by the dilution method and estimated value for the visceral fat rating by MRI method using the Bioelectrical Impedance Analysis (BIA method).

BIA is a means of measuring body composition – fat mass, predicted muscle mass, etc. – by measuring bioelectrical impedance in the body. Fat within the body allows almost no electricity to pass through, while electricity passes rather easily through water, much of which is found in muscles. The degree of difficulty with which electricity passes through a substance is known as the electrical resistance, and the percentage of fat and other body constituents can be inferred from measurements of this resistance. The various criteria for body composition measurement and analysis are shown in Figure 3.4.

Figure 3.4 Body Composition Analysis

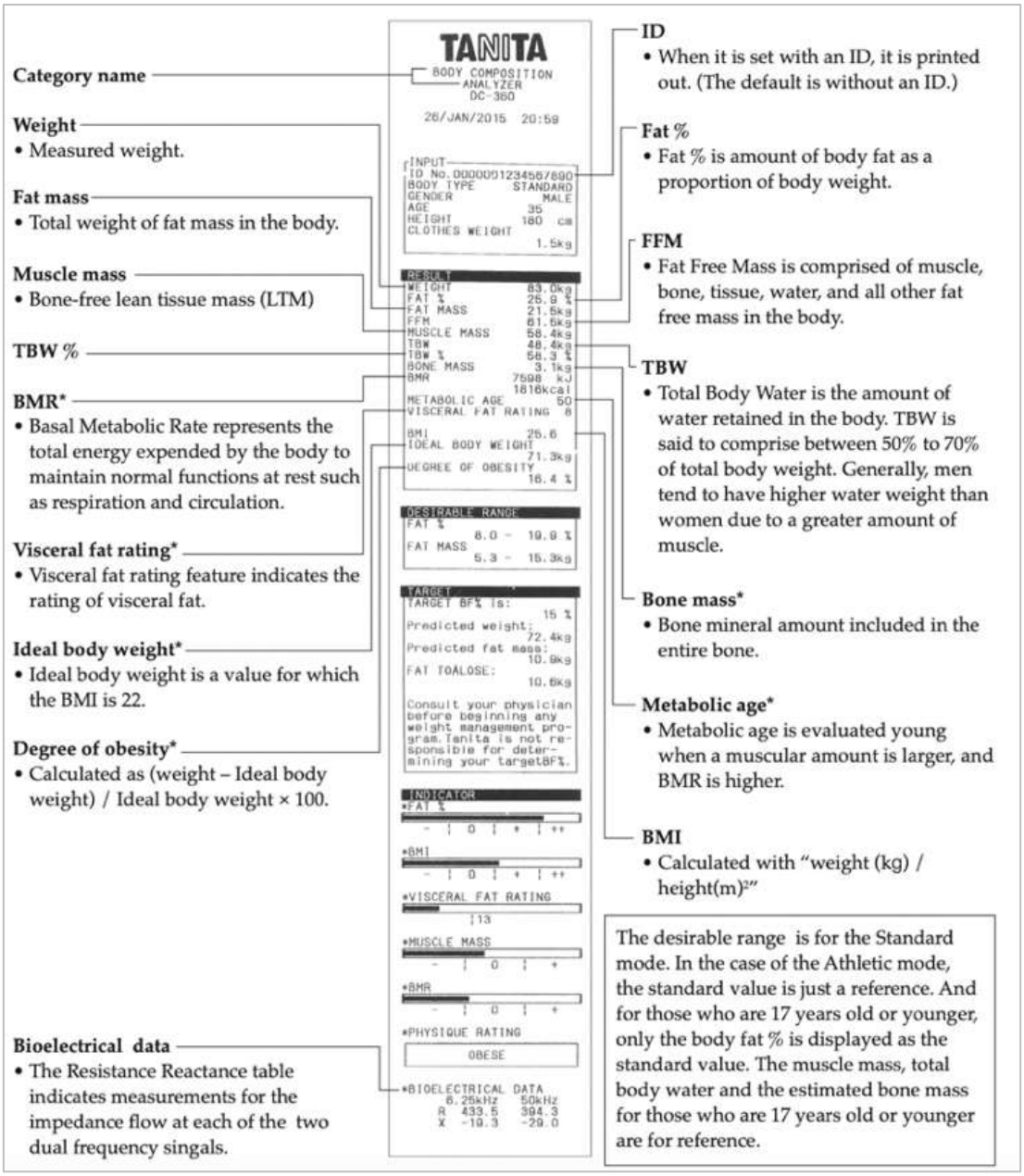


Figure 3.5 Body Composition Analyzer: TANITA DC360

3. Blood Pressure and Heart Rate (pulse) Measurement

Blood pressure is the force of the blood pushing against the artery walls during contraction and relaxation of the heart. Each time the heart beats, it pumps blood into the arteries, resulting in the highest blood pressure as the heart contracts. When the heart relaxes, the blood pressure falls. Two numbers are recorded when measuring blood pressure. The higher number, or systolic pressure, refers to the pressure inside the artery when the heart contracts and pumps blood through the body. The lower number, or diastolic pressure, refers to the pressure inside the artery when the heart is at rest and is filling with blood. Both the systolic and diastolic pressures are recorded as “mm Hg” (millimeters of mercury). For pulse rate is a measurement of the heart rate, or the number of times the heart beats per minute. As the heart pushes blood through the arteries, the arteries expand and contract with the flow of the blood. Taking a pulse not only measures the heart rate, but also can indicate the following: heart rhythm, strength of the pulse rate. In this study, the participants will be Blood Pressure and Heart Rate (pulse) by TM-2657P Fully Automatic Blood Pressure Monitors.

Figure 3.6 TM-2657P Fully Automatic Blood Pressure Monitors

4. Brainwave Measurement (Electroencephalogram, EEG)

Electroencephalography (EEG) is a method to record an electrogram of the spontaneous electrical activity of the brain. Voltage fluctuations measured by the EEG bioamplifier and electrodes allow the evaluation of normal brain activity. As the electrical activity monitored by EEG originates in neurons in the underlying brain tissue, the recordings made by the electrodes on the surface of the scalp vary in accordance with their orientation and distance to the source of the activity. A healthy human EEG will show certain patterns of activity that correlate with how awake a person is.

The range of frequencies one observes are between 1 and 30 Hz, and amplitudes will vary between 20 and 100 μV. The observed frequencies are subdivided into various groups: delta (0.5–3 Hz), theta (4–7 Hz), alpha (8–13 Hz) and beta (13–30 Hz). Alpha waves are observed when a person is in a state of relaxed wakefulness and are mostly prominent over the parietal and occipital sites. During intense mental activity, beta waves are more prominent in frontal areas as well as other regions. In this study, the participants will be measured electrical brain signals to assess relaxation conditions using the ratio between alpha and beta EEG signals (Alpha/Beta) with the SeMind EEG of the Faculty of Medical Technology, Mahidol University (MUMT) (Figure 3.7).

Figure 3.7 The *SeMind EEG* of the Faculty of Medical Technology, Mahidol University (MUMT)

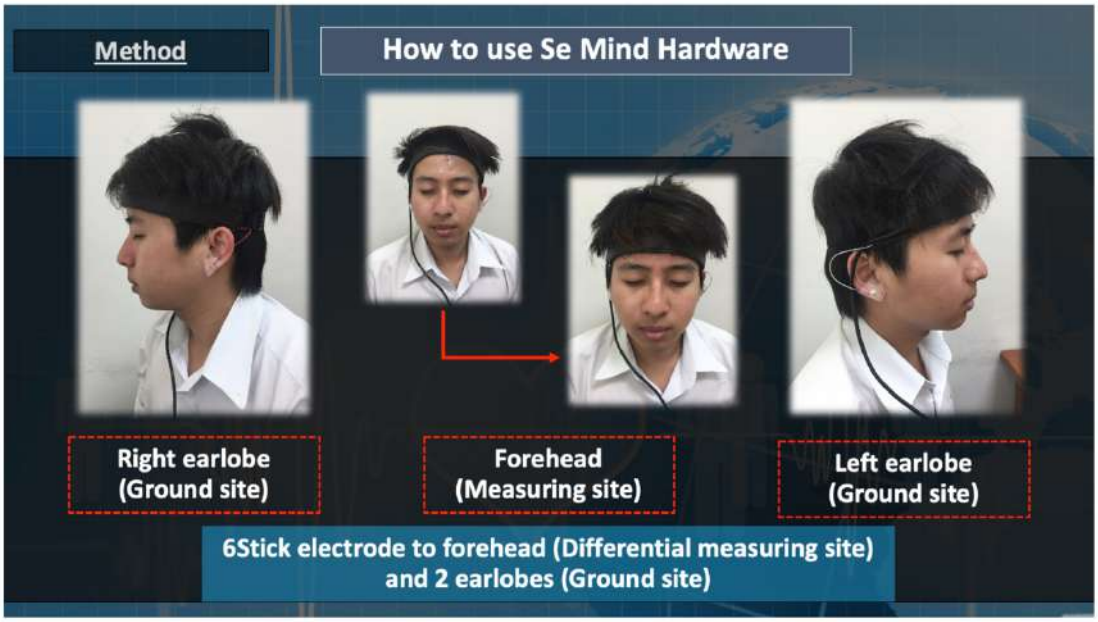
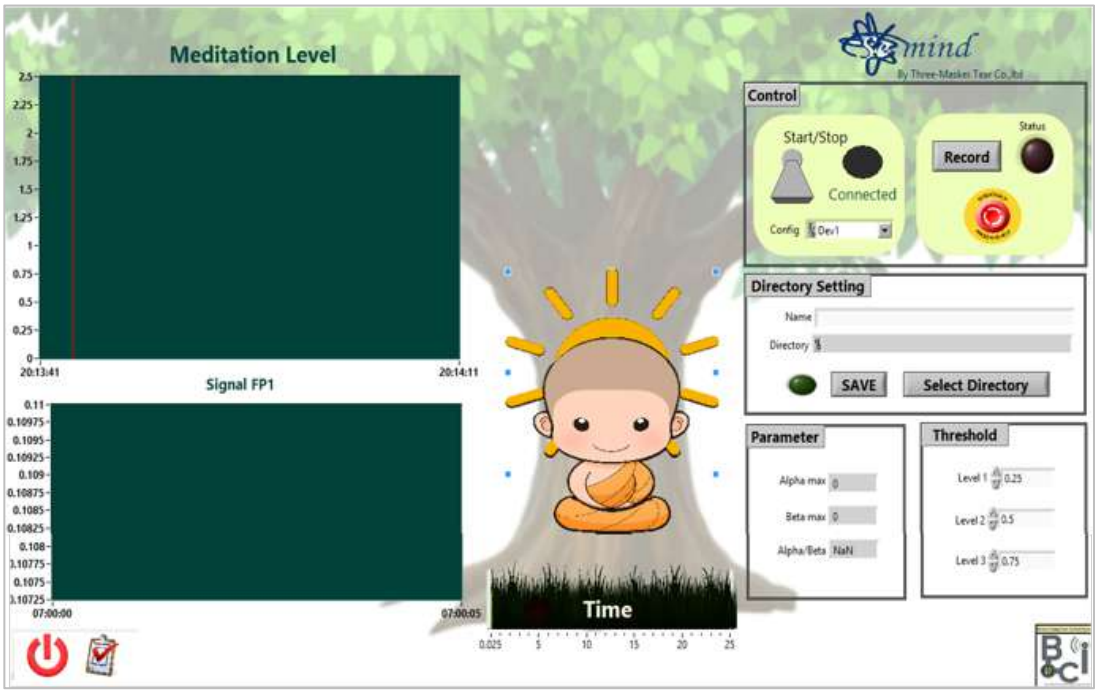
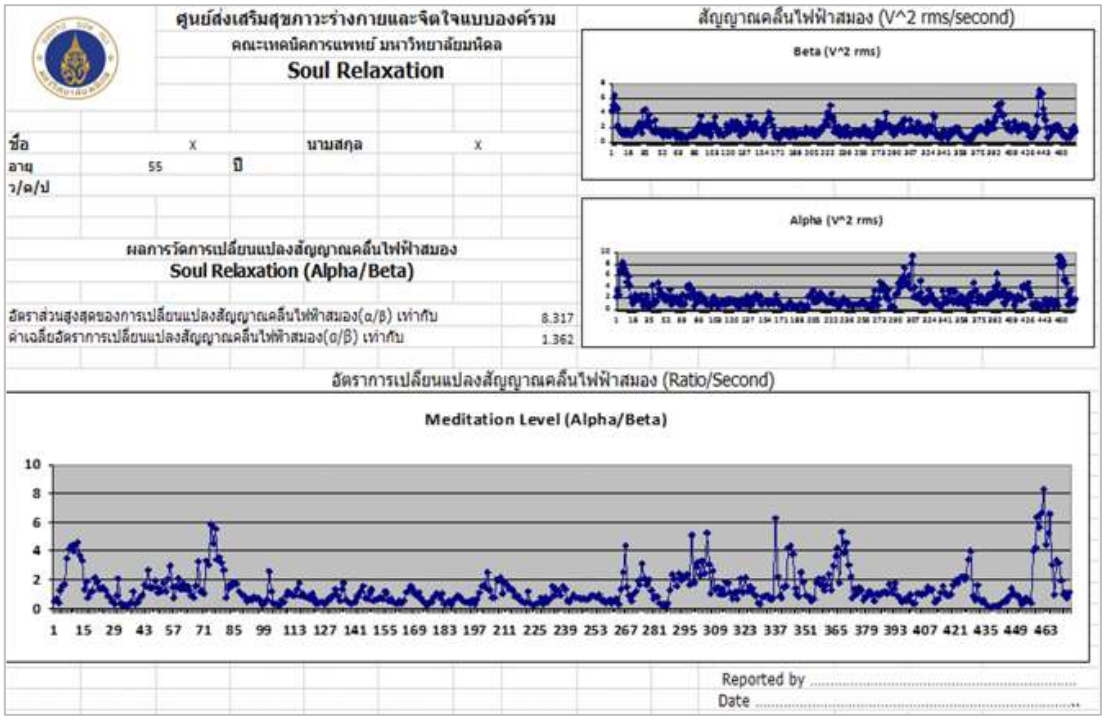


Figure 3.8 Alpha/Beta Ratio Analysis from The *SeMind EEG*





5. Stress Level Test

Stress can be divided into 4 levels: Mild stress means a small amount of stress. and disappeared in a short period of time. This stress can occur in everyday life. It is not a threat to life. People can adapt automatically through habit and the adjustment requires only a small amount of energy. It is a state of relaxation of the body. Moderate stress refers to stress that occurs in daily life because there is a threat or encounter an important event in society, people will react in the form of anxiety, fear, etc. This is within the general normal range, not severe enough to cause harm to the body. It is a level of stress that make people excited.

High stress is the level at which a person is exposed to events that cause high stress. Unable to adjust to reduce stress in a short period of time is in the danger zone. If not alleviated, it will lead to chronic stress or various diseases. Severe stress is the highest levels of stress that is continued for a long-time causing people to fail in adapting to the point of being bored, discouraged, exhausted, and unable to control themselves. Physical symptoms or various illnesses can easily occur. In this study, Suanprung Stress Test 20 (SPST), Department of Mental Health, Ministry of Public Health will be used as the questionnaire for assessing the participants 'stress level. Suanprung Stress Test 20 (SPST) is a standard stress measurement form which passed the concurrent validity test. The SPST is used to explore feelings over the past 6 months, whereby the content involves the occurrence and feelings towards such occurrence. The assessment criteria are as follows:

Level of stress in the scale "1"	means	"No Stress"
Level of stress in the scale "2"	means	"Mild Stress"
Level of stress in the scale "3"	means	"Moderate Stress"
Level of stress in the scale "4"	means	"High Stress"
Level of stress in the scale "5"	means	"Severe Stress"

Total scores will be summed up and compared with the criteria for assessment on the level of stress as follows:

0-24 points	represent	low stress.
25-42 points	represent	moderate stress.
43-62 points	represent	high stress.
> 63 points	represent	severe stress.

Qualitative Research Instrument

6. In-depth Interview Questions

During the post-test data collection, in-depth interview questions were conducted to gain the subjective experiences and perceptions of practitioners regarding the effects of FFMBI intervention. The interview questions are divided into three main parts, focusing on practitioners' experiences and perceptions related to their bodies and minds, and the integration of mindfulness practices into daily life. The questions are as follows:

6.1 After receiving the Four Foundations of Mindfulness-Based Intervention (FFMBI) for 7 consecutive days, what physical changes have you noticed?

6.2 After receiving the Four Foundations of Mindfulness-Based Intervention (FFMBI) for 7 consecutive days, what mental changes have you noticed?

6.3 How do you plan to integrate the knowledge and experience gained from the FFMBI intervention into your daily life?

3.3.3 The Measurement of the Instrument

In this research, the Stress Level questionnaire was invented by Suanprung Stress Test 20 (SPST). The researcher put the question items in an online questionnaire via google forms. The try-out test was distributed to 30 practitioners who met the same inclusion criteria as those in the sampling group.

The Analysis of Reliability

Reliability is to ensure the internal consistency of the items in the questionnaire. This research measured the Internal Consistency Reliability by using Cronbach's Alpha Coefficient. Louis Cohen, Lawrence Manion & Keith Morrison (2007) illustrated the value of Coefficient Cronbach's Alpha (a) as shown in Table 3.4.

Table 3.4 The Analysis of Reliability

Cronbach's Alpha Coefficient	Internal Consistency Level
≥ 0.90	Very highly reliable
0.80-0.90	Highly reliable
0.70-0.79	Reliable
0.60-0.69	Marginally/minimally reliable
< 0.60	Unacceptably low reliability

The results of reliability, if the reliability score is nearly 1, it means that the consistent of questionnaire is high. This research questionnaire, the scales have good reliabilities which more than 0.7 as shown in Table 3.5.

Table 3.5 The Results of Reliability Analysis – Cronbach's Alpha Coefficient

Name of Questionnaires	Number of Questions	Results of Cronbach's Alpha Coefficient
Stress Level Test	20	0.89

Examples of the Questionnaire

The example of the questionnaire used to collect data and the criteria of scoring scale of the questionnaire in the research are described as follows:

Part 1: The Demographic Information

The questionnaire is used to inquire about personal information of namely, gender, age, level of graduate students, residence, marital status of father and mother, and monthly income.

Part 2: The Stress Level: Suanprung Stress Test 20 (SPST)

1. I have been afraid of making mistakes.

2. I have failed to reach my goal.

3. My family has had conflicts over financial issues and household affairs.

4. I have worried about toxins and pollution in air, water, noise, and soil.

5. I have felt like I am in competition or being compared with others.

6. I have struggled financially.

7. I have experienced muscular tension or pain.

8. I have had muscular tension headaches.

9. I have had back pain.

10. My appetite has undergone changes.

11. I have had a migraine.

12. I have felt worried and anxious.

13. I have felt frustrated or uneasy.

14. I have felt angry or irritated.

15. I have felt sad.

16. I have had memory problems.

17. I have felt confused.

18. I have been unable to concentrate.

19. I have often felt fatigued.

20. I have frequently caught colds.

3.3.4 Data Collection

3.3.4.1 Quantitative Data Collection: The quantitative data were collected through various measurements, including salivary cortisol tests, body composition analysis, blood pressure and pulse rate measurements, brainwave measurements using electroencephalography (EEG), and self-reported stress test. Measurements were taken before the intervention (pretest) and after the intervention (posttest) to assess changes in the dependent variables. Quantitative data collection was divided into two distinct domains: physiological (body) and psychological (mind), as follows:

Data Collection of Physiological (Body) Measurement

1. Saliva Cortisol Test

The participant collects a saliva sample using a Salivette device. Remove the swab from the suspended insert and gently chew for about 2 minutes to thoroughly saturate the swab with saliva. Replace the swab into the suspended insert and close the tube. The saliva samples will be transported to laboratory then centrifuged the Salivette for 2 minutes at 1000 g to separate off the saliva into the outer tube. Use the clear supernatant for the Elecsys Cortisol assay and collect data.

2. Body Composition

The participant stands on the scale (Tanita DC360) with bare feet because the electrodes need skin contact. Stand completely still during the measurements and collect data.

3. Blood Pressure and Heart Rate (pulse) Measurement

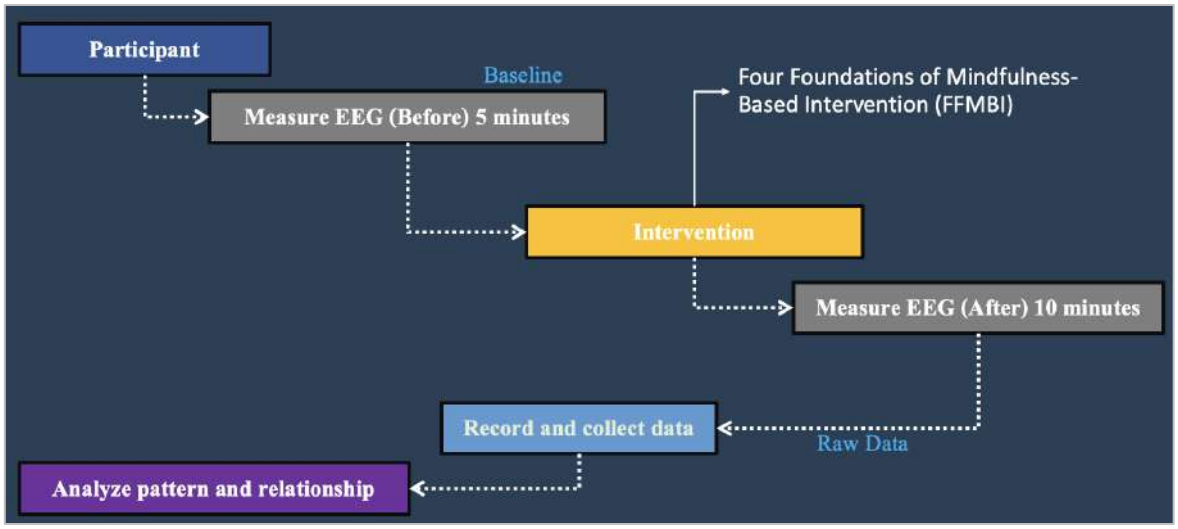
The participant sits quietly for three to five minutes beforehand with good back support at a table. Place feet flat on the floor and lean against the back of the chair. Stretch out arm, palm upward then press start on automatic blood pressure monitor and collect data.

Data Collection of Psychological (Mind) Measurement

4. Brainwave Measurement (Electroencephalogram, EEG)

The participants will be cleaned the area where the electrodes are attached in the middle of the forehead and both earlobes and use 70% alcohol. Then apply gel to the area where the electrodes are placed to be used as a conductor for electrical brain waves. The participants must close their eyes while taking measurements for 15 minutes because the researcher wants to eliminate exposure to other stimuli such as things seen while measuring from looking at outside objects. The analysis of the EEG measurement results will be led by MU team. The MU team will measure and collect the EEG results by analyzing alpha brain waves, beta brain waves, and the proportion of alpha brain waves / beta brain waves (Figure 3.9).

Figure 3.9 Workflow for EEG Measurement for FFMBI



5. Stress Level Test

The stress level of participants will be evaluated using the Suan Prung Stress Test (SPST-20) containing 20 self-administered questions. The SPST-20 score defines four levels of stress: (i) 0-24: mild, (ii) 25-42: moderate, (iii) 43-62: high, and (iv) over 63: severe stress. The participants have to complete the questionnaire before and after attending intervention. However, incomplete questionnaires will be excluded.

3.3.4.2 Qualitative Data Collection: In-depth interviews were conducted with the practitioners to gather qualitative data on their experiences, perceptions, and insights regarding the FFMBI intervention. The interviews provided a deeper understanding of the subjective impact and benefits of the intervention.

3.3.5 Experiment

3.3.5.1 Preparation Before the Experiment

1. Organized a joint planning meeting between the MCU research team and the Holistic Health and Medical Diagnostic Center, Faculty of Medical Technology, Mahidol University (MUMT), to collaboratively plan the experiment.

2. The research project was reviewed and approved by the Research Ethics Committee of MCU. Data collection followed the approved procedures.

3. The research team selected the sample group based on the specified inclusion criteria.

4. Requested permission to conduct and implement the FFMBI experiment at Wat Bhaddanta Arsabharam, Chonburi Province, Thailand.

5. Held an orientation with the selected group of 30 individuals to provide detailed information about the research procedures and invited their participation.

6. Participants in the experiment voluntarily signed consent forms, confirming their willingness to be part of the sample group and allowing them to make informed decisions.

3.3.5.2 Preparation of Data Collection during the Experiment

The researchers held a joint planning meeting between MCU and MUMT to finalize the experimental plan as shown in Table 3.6.

Table 3.6 Experimental Plan

Date/Time	Activities	Responsible Persons	Remark
7 July 2024 (Before the experiment)	**1. Orientation for Participants:** Researchers from MCU and the Faculty of Medical Technology, Mahidol University, provide an experimental orientation for the sample group of 30 participants at the International Buddhist Studies College (IBSC), MCU	1. Dr. Nadnapang Phophichit 2. Phramaha Phuen Kittisobhano, Asst. Prof. Dr. 3. Phramaha Anon Anando, Asst. Prof. Dr. 4. Phramaha Duangthip Pariyattidhari, Dr. 5. Dr. Sakchai Sakabucha 6. Assoc.Prof.Dr. Wilasinee Jeungprasopsuk 7. Dr. Tararat Khaokhiew	MCU & MUMT Team
7 July 2024 (Before the experiment)	**2. Pre-Intervention Physiological (Body) and Psychological (Mind) Measurements:** The participants completed pre-intervention measurements at IBSC, MCU, before receiving the FFMBI, which included: 1. Saliva Cortisol Test 2. Body Composition Analysis 3. Blood Pressure and Heart Rate (Pulse) Measurement 4. Brainwave Measurement (EEG) 5. Stress Level Test	1. Assoc.Prof.Dr. Wilasinee Jeungprasopsuk 2. Dr. Tararat Khaokhiew	MUMT Team
8 – 15 July 2024 (Receiving FFMBI)	**3. Receiving the FFMBI Intervention (7-Day Program):** The sample group participates in a 7-day Four Foundations of Mindfulness-Based Intervention (FFMBI) program at Wat Bhaddanta Arsabharam, Chonburi Province, Thailand	1. Dr. Nadnapang Phophichit 2. Phramaha Phuen Kittisobhano, Asst. Prof. Dr. 3. Phramaha Anon Anando, Asst. Prof. Dr. 4. Phramaha Duangthip Pariyattidhari, Dr. 5. Dr. Sakchai Sakabucha	*Vipassanā* Meditation Masters and MCU Team

Table 3.6 Experimental Plan (Cont.)

Date/Time	Activities	Responsible Persons	Remark
15 July 2024 (After the experiment)	**4. Post-Intervention Physiological (Body) and Psychological (Mind) Measurements:** After receiving the Four Foundations of Mindfulness-Based Intervention (FFMBI), the following measurements are conducted: 1. Saliva Cortisol Test 2. Body Composition Analysis 3. Blood Pressure and Heart Rate (Pulse) Measurement 4. Brainwave Measurement (EEG) 5. Stress Level Test **5. In-Depth Interviews:** Conduct in-depth interviews with participants to assess their experiences, insights, and perceived changes after the intervention.	1. Dr. Nadnapang Phophichit 2. Phramaha Phuen Kittisobhano, Asst. Prof. Dr. 3. Phramaha Anon Anando, Asst. Prof. Dr. 4. Phramaha Duangthip Pariyattidhari, Dr. 5. Dr. Sakchai Sakabucha 6. Assoc.Prof.Dr. Wilasinee Jeungprasopsuk 7. Dr. Tararat Khaokhiew	MCU & MUMT Team

3.3.5.3 Experimental Design

The study employed a one-group pretest-posttest design to compare the effects of the FFMBI on the physiological and psychological outcomes of practitioners, as shown in the Figure below.

Figure 3.10 One-Group Pretest-Posttest Design

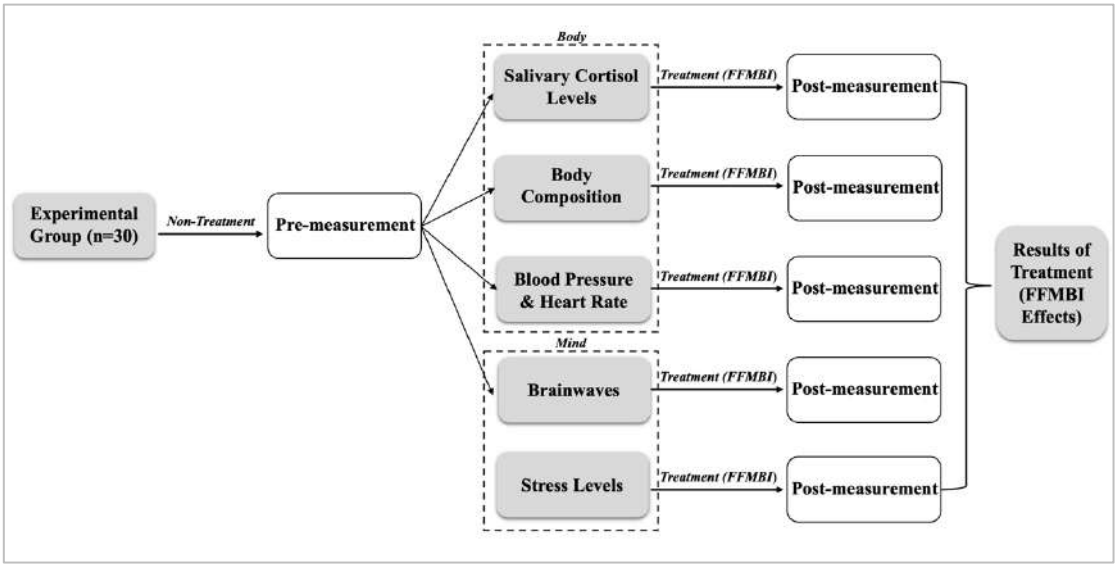
Group	*Pre-test*	Treatment	*Post-test*
Experiment	O_1	X	O_2

Where O_1 = *Pre-test*

O_2 = *Post-test*

X = Treatment (FFMBI)

Figure 3.11 Experimental Process



3.3.6 Data Analysis

3.3.6.1 Phase 1: Qualitative Data Analysis for the Development of the Four Foundations of Mindfulness-Based Intervention (FFMBI)

The qualitative data analysis in Phase 1 focused on synthesizing information from two primary sources: a comprehensive literature review and in-depth interviews with six Buddhist scholars and six *Vipassanā* meditation masters. The analysis followed a thematic analysis approach, involving systematic coding, categorization, and theme development to extract key insights relevant to the design of the FFMBI. The main thematic areas identified were:

1. Appropriate Duration: Identifying the recommended length of the intervention necessary to facilitate observable physical and mental changes among practitioners, based on traditional teachings and expert opinions.

2. Ideal Structure and Balance: Designing the daily schedule to balance various mindfulness practices, including sitting meditation, walking meditation, mindful standing, mindful lying down, and contemplation of minor daily activities.

3. Supplementary Activities: Exploring the importance of integrating supportive activities such as Dhamma talks and individual meditation interview

sessions to deepen understanding, provide motivation, and address arising challenges during practice.

4. Supportive and Obstructive Factors: Identifying key factors that enhance or hinder the effectiveness of the intervention, including supportive elements such as conducive environmental settings, appropriate food arrangements, the absence of mobile phone use, and the practice of noble silence.

All interviews were audio- and video- recorded and transcribed verbatim. The qualitative data were analyzed through a reflective thematic approach, where recurring ideas and key themes were identified organically based on the kay-informants' narratives. Rather than applying a rigid coding framework, the analysis emphasized capturing the depth and nuances of the informants' experiences and insights, which were inherently tied to spiritual and traditional practices. Themes that emerged were directly integrated into the intervention design, ensuring authenticity to the *Satipaṭṭhāna Sutta* while being applicable for contemporary practitioners.

To ensure credibility, the emergent themes and their application in the program design were periodically reviewed in discussions with other researchers familiar with mindfulness-based interventions, allowing for cross-validation of interpretations while respecting the non-mechanistic nature of the spiritual insights provided.

3.3.6.2 Phase 2: Quantitative + Qualitative Data Analysis

1. Quantitative Data Analysis for Implementation, Experimental Intervention, and Evaluation

The quantitative data collected in Phase 2 were analyzed to evaluate changes in physiological and psychological outcomes before and after the FFMBI intervention. The analysis procedures included:

1. Descriptive Statistics: Used to summarize participants' demographic information and baseline characteristics (e.g., mean, standard deviation, frequency, and percentage).

2. Inferential Statistics: Paired Sample t-tests (or Wilcoxon Signed-Rank tests if data distribution was non-normal) were used to compare pre- and post-intervention measurements of Salivary cortisol levels, Body composition parameters (BMI, fat mass, lean mass, bone mass, water content), Blood pressure (systolic and diastolic) and pulse rate, Brain wave activity (alpha/beta ratios), and Self-reported stress levels (via Suanprung Stress Test-20).

3. Effect Size Calculation: Cohen's d was calculated to determine the magnitude of the intervention's effects.

All quantitative analyses were conducted using IBM SPSS Statistics 29.0.2.0, with statistical significance set at $p < 0.05$.

2. Qualitative Data Analysis for Post-Intervention In-Depth Interviews

Qualitative data from semi-structured post-intervention interviews were analyzed using a reflective thematic approach to explore practitioners' subjective experiences following the 7-day FFMBI program. The analysis focused on three main inquiry areas:

1. Physical Changes: Participants' observations regarding any physical improvements, such as better sleep quality, reduced bodily tension, improved digestion, or changes in energy levels.

2. Mental Changes: Participants' self-reported mental improvements, including stress reduction, enhanced emotional regulation, increased clarity of mind, and deepened mindfulness.

3. Future Integration: Insights into participants' intentions to apply the mindfulness techniques learned during the intervention into their everyday lives, including planned adaptations for work, family, and personal wellbeing.

Thematic patterns were identified organically through careful reading and reflection rather than rigid coding. To ensure credibility and reduce potential bias, findings were cross-validated by an independent reviewer. The emergent themes

provided rich qualitative insights that complemented the quantitative findings, offering a holistic evaluation of the FFMBI's impact.

3.3.7 Statistical Usage

This study employed a range of statistical methods to analyze quantitative data and evaluate the effectiveness of the intervention. Internal consistency of the stress assessment instrument (SPST-20) was examined using Cronbach's alpha to ensure the reliability of self-report measures. Descriptive statistics, including means and standard deviations, were used to summarize physiological and psychological outcomes such as salivary cortisol levels, body composition, cardiovascular indicators, EEG patterns, and stress scores. To assess within-subject changes before and after the intervention, paired-sample t-tests were conducted. The magnitude of observed effects was further interpreted using Cohen's d to determine the practical significance of the findings.

3.3.7.1 Instrument Reliability

To ensure the consistency of self-report measures, the internal consistency of the SPST-20 scale was assessed using Cronbach's alpha (α). For a scale with k items, item variances σ_i^2, and total-test variance σ_t^2, Cronbach's alpha is computed as[3]:

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum_{i=1}^{k}\sigma_i^2}{\sigma_T^2}\right)$$

Where α = Cronbach's alpha coefficient

k = Number of items in the scale

σ_i^2 = Variance of individual item

σ_t^2 = Variance of the total test score

A coefficient of $\alpha \geq 0.70$ was considered acceptable, indicating that the items reliably measure the same underlying construct.

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[3] Cronbach, L. J., "Coefficient Alpha and the Internal Structure of Tests," *Psychometrika*, Vol. 16 No. 3 (1951): 297–334.

3.3.7.2 Descriptive Statistics

Continuous outcome variables such as salivary cortisol, body composition parameters, cardiovascular measures (systolic/diastolic blood pressure, pulse rate), EEG wave-ratio indices, and stress scores were summarized using the sample mean and standard deviation[4]:

Sample Mean $\bar{X}$, S.D.

$$\bar{X} = \frac{\sum X}{n}$$

Where $\bar{X}$ = The sample mean

ΣX = The sum of all the sample observations

n = The number of sample observations

Standard Deviation (S.D.)

$$S = \sqrt{\frac{\sum \left(X - \bar{X}\right)^2}{n-1}}$$

Where S = The sample standard deviation

$\bar{X}$ = The sample mean

X = The ith element from the sample

n = The number of elements in the sample

Σ = The instruction 'take the sum of' (or add up)

$\left(X - \bar{X}\right)^2$ = The squared deviation

$\Sigma\left(X - \bar{X}\right)^2$ = Take the sum of the squared deviations

$n - 1$ = Degrees of freedom

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[4] Langdridge, Darren, *Research Methods and Data Analysis in Psychology* (England: 2004), p. 106.

3.3.7.3 Pre- Post-Intervention Comparisons (One-Group Design)[5]

Each participant's difference score was defined as:

$$D_i = X_{i,post} - X_{i,pre}$$

The mean and standard deviation of these differences are:

$$\overline{D} = \frac{1}{n}\sum_{i=1}^{n} D_i \; s_D = \sqrt{\frac{\sum(D_i - \overline{D})^2}{n-1}}$$

The standard error of the mean difference:

$$SE_{\overline{D}} = \frac{s_D}{\sqrt{n}}$$

The paired-sample *t*-statistic was then calculated as:

$$t = \frac{\overline{D}}{SE_{\overline{D}}}$$

Where

D_i	=	The sample standard deviation
$\bar{D}$	=	Mean of the difference scores
S_D	=	Standard deviation of the difference scores
SE_D	=	Standard error of the mean difference
t	=	t-statistic for paired samples
n	=	Sample size

[5] David C. Howell, *Statistical Methods for Psychology*, 6th Edition, (Belmont, CA: Thomson Wadsworth, 2007), p. 78.

3.3.7.4 Effect Size

Additionally, Cohen's d was calculated to determine the magnitude of change resulting from the intervention:

$$d = \frac{\overline{D}}{s_D}$$

Where d = Cohen's d effect size

$\bar{D}$ = Mean of the difference scores

S_D = Standard deviation of the difference scores

Statistical Power Analysis

A priori power analysis was conducted using G*Power version 3.1.9.4 to determine the required sample size for detecting an effect. The analysis indicated that with an effect size of dz = 0.8 (large effect), an alpha level of α = 0.05, and a desired power of 0.80, a minimum of 15 participants would be needed for a paired samples t-test. With the actual sample size of 30 participants, the achieved power was approximately 0.82, ensuring sufficient statistical power to detect meaningful effects. All results were interpreted at α = 0.05 significance level.

3.3.8 Human Research Ethical Considerations

This research was conducted in accordance with international ethical standards and was approved by the Research Ethics Committee of Mahachulalongkorn-rajavidyalaya University. The research ethics approval code is R.263/2024, certified on May 9, 2024. The committee confirmed that the research protocol aligns with international codes of ethics, national laws, and regulatory requirements. All participants were provided with detailed information about the study and signed informed consent forms before participating. They were informed that participation was voluntary and that they could withdraw at any time without penalty. Confidentiality of participants' personal information and data was maintained throughout the research process. The study was designed to minimize potential risks and ensure the well-being of all participants.

Chapter 4

Results of Data Analysis

This chapter presents the comprehensive findings of the Four Foundations of Mindfulness-Based Intervention (FFMBI) study. Consistent with the mixed-methods research design outlined in Chapter 3, the results integrate qualitative and quantitative data to evaluate both the development and the effects of the FFMBI program. The chapter first discusses the qualitative findings from Phase 1, including the thematic analysis of literature and in-depth interviews, which guided the structure of the FFMBI. It then presents the Phase 2 results, highlighting the program's effects on physiological (body composition, blood pressure, pulse rate, salivary cortisol, brainwaves) and psychological (stress) outcomes. Finally, participant feedback and new knowledge contributions are discussed in relation to potential national research impact.

4.1 Analysis Results of Phrase 1: Qualitative Research Method

Objective 1 aimed to develop a Four Foundations of Mindfulness-Based Intervention (FFMBI) by integrating insights from Buddhist scholars and *Vipassanā meditation* masters, in accordance with the concepts of the Four Foundations of Mindfulness practice in the *Satipaṭṭhāna Sutta*.

This section presents the qualitative findings that informed the structure and content of FFMBI. Drawing on a comprehensive literature review and twelve in-depth interviews with senior Buddhist scholars and *Vipassanā masters*, the analysis explicates how their collective wisdom was distilled into the core design principles—duration, daily schedule, supportive activities, and conditions—of the seven-day FFMBI program.

4 .1 .1 Results of Literature Review

The documentary method employed a systematic literature review (as described in Section 3.2.1 and Table 3.2) to extract foundational concepts and practical elements for the design of the Four Foundations of Mindfulness-Based Intervention (FFMBI). This process aimed to ensure doctrinal accuracy while integrating practical applications from traditional and modern sources.

The review focused on primary sources—such as English translations of the *Pāli* Canon (including the *Dīgha Nikāya, Majjhima Nikāya*), Visuddhimagga, and *Satipaṭṭhāna* commentaries—and secondary sources, including contemporary meditation manuals and peer-reviewed research on mindfulness interventions. Databases such as SuttaCentral, JSTOR, Scopus, and PubMed were searched using Boolean terms: ("Four Foundations of Mindfulness" OR "*Satipaṭṭhāna*") AND (practice OR schedule OR intervention). Additional sources were identified through snowballing techniques from reference lists.

Inclusion criteria were: (i) English-language texts, (ii) explicit discussion of at least one foundation of mindfulness with practical guidance, and (iii) full-text availability. Using thematic analysis, meaning-bearing units were identified and synthesized into six major themes:

1. Contemplation of the Body (*kāyānupassanā*)
2. Contemplation of Feelings (*vedanānupassanā*)
3. Contemplation of Mind (*cittānupassanā*)
4. Contemplation of Dhamma Objects (*dhammānupassanā*)
5. Practice Guidelines and Daily Structure
6. Supportive environmental and conditions for mindfulness cultivation

These themes directly informed the FFMBI program's core structure, ensuring doctrinal authenticity and practical applicability as shown in Table 4.1.

Table 4.1 Key Themes Derived from the Thematic Analysis of Literature on the Four Foundations of Mindfulness

Theme	Description
1. Contemplation of the Body (*kāyānupassanā*)	The *Satipaṭṭhāna Sutta* outlines fourteen contemplative methods under *Kāyānupassanā*, including mindfulness of breathing, postures, clear awareness, repulsiveness of the body, the four elements, and charnel ground reflections. According to the commentaries, only three of these—(1) contemplation of the four postures (*iriyāpathapabba*), (2) clear comprehension (*sampajānapabba*), and (3) contemplation of the elements (*dhātumanasikārapabba*)—are classified as direct *Vipassanā* (insight) practices. The FFMBI program focuses on these three insight-based methods, as they cultivate mindfulness and wisdom through direct observation of bodily processes, leading to insight into impermanence (*anicca*), unsatisfactoriness (*dukkha*), and non-self (*anattā*).
2. Contemplation of Feelings (*vedanānupassanā*)	Involves mindful observation of pleasant, unpleasant, and neutral feelings, with emphasis on non-attachment and equanimity.
3. Contemplation of the Mind (*cittānupassanā*)	Focuses on awareness of the presence or absence of mental states such as craving, anger, distraction, or concentration, enabling introspection and emotional regulation.

Table 4.1 Key Themes Derived from the Thematic Analysis of Literature on the Four Foundations of Mindfulness (Cont.)

Theme	Description
4. Contemplation of Mental Objects (*dhammānupassanā*)	Centers on observing mental phenomena, including hindrances, aggregates, sense bases, and factors of enlightenment, encouraging deep insight into the nature of mind and reality.
5. Practice Guidelines and Daily Structure	Provides directives on optimal retreat duration (e.g., minimum 7 days), balanced posture sequences (walking/sitting), mindfulness of daily activities, and observance of noble silence.
6. Supporting and Obstructive Conditions	Identifies conducive environments (quiet, disciplined, tech-free), supportive elements (plant-based diet, meditation interviews), and obstacles (e.g., distractions, unstructured practice) that influence the effectiveness of FFMBI.

4 .1 .2 Results of In-depth Interview

To complement the literature review, in-depth semi-structured interviews were conducted with 12 purposively selected key informants—six *Vipassanā* meditation masters and six Buddhist scholars—each with substantial experience in Satipaṭṭhāna practice and teaching. The objective was to enrich the design of the Four Foundations of Mindfulness-Based Intervention (FFMBI) with experiential wisdom and ensure both doctrinal fidelity and practical feasibility.

All interviews were face-to-face, audio/video recorded with consent, and transcribed verbatim. Thematic analysis followed a reflective, inductive process, allowing themes to emerge organically. Peer review was used to validate findings. Key themes included optimal retreat structure, posture balance, environmental settings, and

supplementary practices. The key informants provided valuable insights into the optimal structure for the FFMBI program as follows:

4.1.2.1 Minimum Duration and Rationale

All informants agreed that a 7-day retreat is the minimum required to induce tangible physical and mental transformation. While some recommended extending to 10, 15, or even 30 days for deeper insight, it was emphasized that even a single day of fully engaged, properly guided practice can bring benefits—particularly when rooted in correct Vipassanā instruction.

4.1.2.2 Core Daily Schedule Design

A consensus emerged that a strict and structured timetable was essential. The proposed daily routine begins at 03:30 a.m. and ends at 21:00 p.m., incorporating walking/sitting meditation in alternating 60-minute blocks, mindfulness of minor activities (e.g., washing, eating), and formal practices such as Dhamma talks and interviews. The schedule supports disciplined continuity of mindfulness.

4.1.2.3 Meditation Postures and Balance

All *Vipassanā* masters emphasized alternating between walking and sitting meditation. This balance nurtures the Five Controlling Faculties (*indriya*): faith (*saddhā*), energy (*viriya*), mindfulness (*sati*), concentration (*samādhi*), and wisdom (*paññā*). Each formal session is ideally 60 minutes but can be adjusted depending on participant readiness.

4.1.2.4 Contemplation of Minor Activities

Practicing mindfulness during daily life tasks—such as brushing teeth, showering, eating, or drinking—is considered essential. This practice extends mindfulness beyond the cushion and integrates it into ordinary behavior, laying the groundwork for continuous insight.

4.1.2.5 Supportive Conditions and Environmental Controls

Key informants emphasized several critical conditions necessary for the success of the FFMBI retreat. Foremost among these was the maintenance of noble silence throughout the entire program, which was seen as vital to preserving internal

focus and minimizing verbal distractions. The complete abstention from mobile phone use was also considered essential for eliminating external stimuli and fostering deeper introspection. To support personal regulation and uninterrupted practice, participants were housed in individual residential units. Nutrition was also addressed through the provision of two plant-based meals per day served before noon, in accordance with traditional monastic discipline. Finally, daily meditation interviews and Dhamma talks were incorporated to offer personalized guidance and ensure that the teachings remained grounded in doctrinal authenticity.

Figure 4.1 Daily Schedule for the Four Foundations of Mindfulness-Based Intervention (FFMBI) Program

Time	Activities
03.30 hrs.	Morning wake-up bell / do personal missions with mindfulness
04.30 hrs.	Walking / Sitting Meditation
06.30 hrs.	Breakfast / Contemplation of minor activities
08.30 hrs.	Walking / Sitting Meditation
10.30 hrs.	Lunch / Contemplation of minor activities
12.00 hrs.	Leisure Time / Contemplation of minor activities
13.00 hrs.	Walking / Sitting Meditation / Meditation interview
16.00 hrs.	Shower / Personal missions with mindfulness / Contemplation of minor activities
16.30 hrs.	Mindful drinking
17.30 hrs.	Evening Chanting / Listening to Dhamma Talks
20.00 hrs.	Walking / Sitting Meditation
21.00 hrs.	Sleep with mindfulness / Contemplation of minor activities

Integration Outcome (Literature Review + In-depth Interview)

The findings from both the literature review and the in-depth interviews were synthesized during a focused analytic workshop with the research team. This integration process informed the development of the FFMBI's structural and operational blueprint. The final program was designed as a minimum 7-day FFMBI to ensure sufficient time for psychological and physiological transformation. Core

practices were structured around alternating walking and sitting meditation sessions every 60 minutes, with mindfulness extended into minor daily activities and personal routines. In addition, the program included structured support mechanisms, such as daily Dhamma reflections and one-on-one meditation interviews. All activities were conducted in a controlled environment that minimized distractions and optimized conditions for sustained mindfulness and insight development. Daily Schedule of the FFMBI is shown in Figure 4.1.

4.2 Analysis Results of Phrase 2: Quantitative + Qualitative Research Method

Objectives 2 and 3 aimed to implement the FFMBI in a controlled setting with a cohort of experienced practitioners—assessing feasibility, adherence, and practical application—and to evaluate the effects of the program on key physiological markers (salivary cortisol levels, body composition, blood pressure, and pulse rate), neurophysiological parameters (brain-wave activity), and psychological outcomes (self-reported stress levels).

This section integrates instrument-based measurements collected immediately before and after the retreat with post-intervention interview data. The mixed-methods analysis illuminates not only the physiological and psychological shifts associated with FFMBI but also the practicality of delivering a traditional *Satipaṭṭhāna*-grounded intervention model to contemporary lay practitioners.

4.2.1 Demographic information of the participants

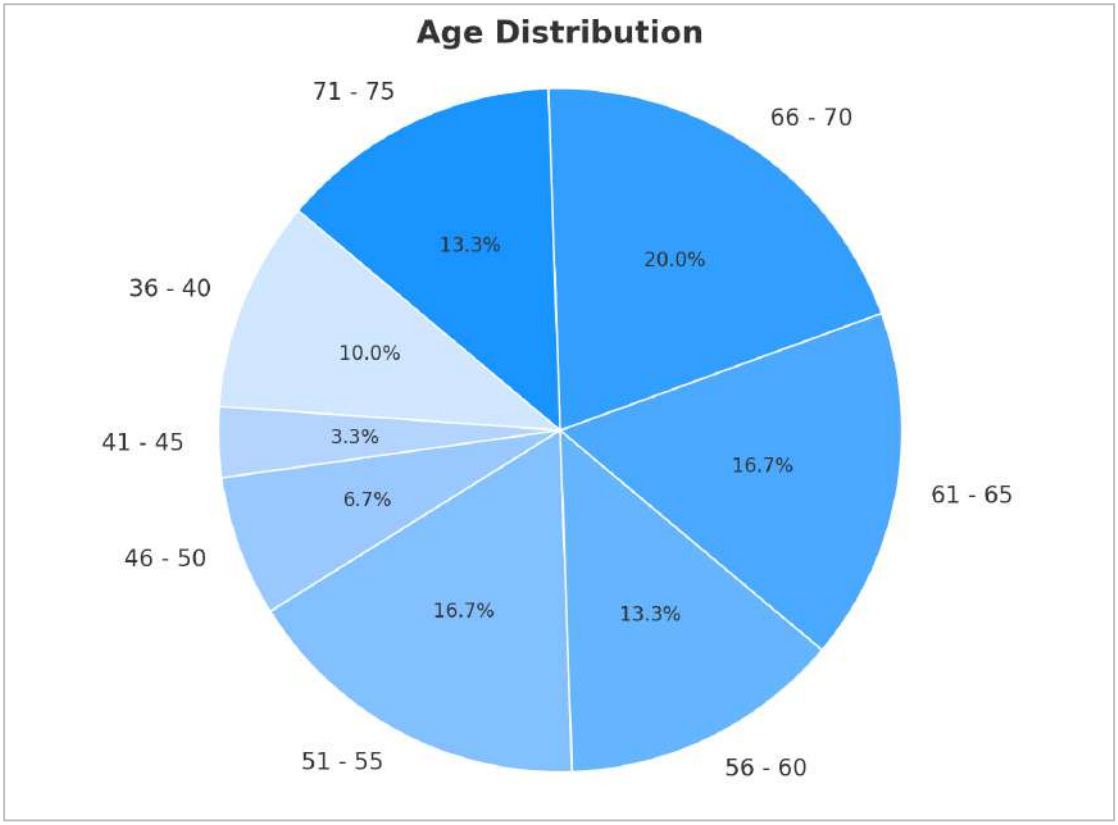
Table 4.2 provides a summary of the demographic information of the 30 participants in the study. It shows that 3.3% of the respondents were male, while 96.7% were female, indicating a significant gender imbalance among the participants.

Table 4.2 Summary of the Demographic Information of the Respondents

Demographic Information	Frequency	Percentage
Gender		
Male	1	3.3
Female	29	96.7
Age		
36 - 40	3	10.0
41 - 45	1	3.3
46 - 50	2	6.7
51 - 55	5	16.7
56 - 60	4	13.3
61 - 65	5	16.7
66 - 70	6	20.0
71 - 75	4	13.3
Previous experience		
Having Experience with *Vipassanā* Meditation	30	100.0
Practiced continuously for 7 days	2	6.7
Practiced continuously for more than 7 days	24	80.0
Practiced continuously for 5 days	2	6.7
Practiced continuously for 4 days	1	3.3
Practiced 1 day	1	3.3

The respondents' ages ranged from 36 to 75 years old. The age distribution was categorized into eight groups. The largest age group was 66-70 years, comprising 20.0% of the respondents, followed by the 61-65 and 51-55 age groups, each representing 16.7% of the respondents. Participants aged 56-60 and 71-75 each accounted for 13.3% of the sample, while those aged 36-40 constituted 10.0%. The smallest age group was 41-45, making up only 3.3% of the participants.

Figure 4.2 Composition of Participants



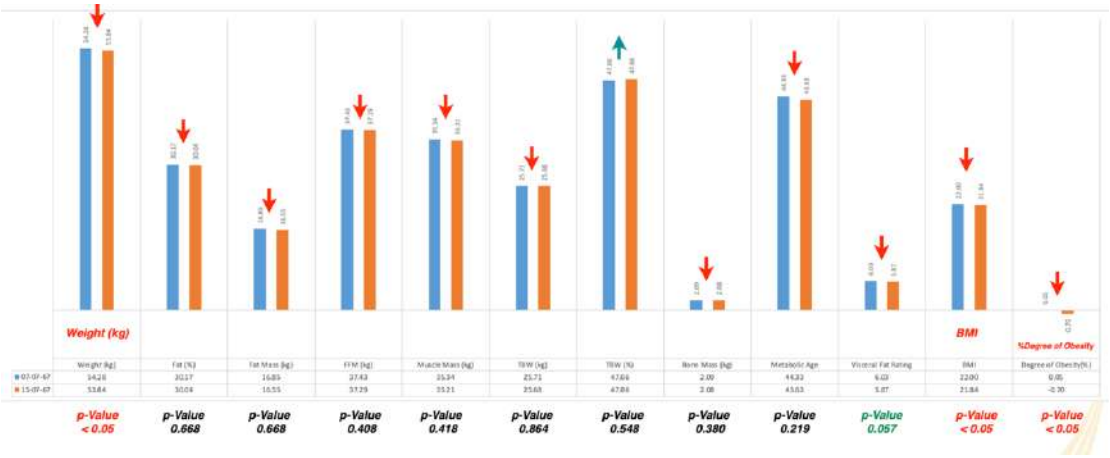
All participants had experience with *Vipassanā* meditation. The data shows that the majority of respondents, 80.0%, practiced continuously for more than 7 days. Participants practicing for exactly 7 days represented 6.7% of the sample, while those practicing for 5 days, 4 days, and 1 day each accounted for 6.7%, 3.3%, and 3.3% respectively.

These findings suggest a high level of commitment to *Vipassanā* meditation among the participants, with the vast majority practicing for extended periods. The gender disparity and the concentration of older participants highlight the need for targeted outreach to encourage a more diverse group of individuals to engage in mindfulness practices. The overall experience and prolonged engagement in meditation practices reflect the potential for significant physical and mental benefits, as explored further in this study.

4.2.3 Body Composition Measurements

The body composition measurements taken before and after the Four Foundations of Mindfulness-Based Intervention (FFMBI) revealed some changes in participants' physical parameters.

Figure 4.3 Results of the Body Composition Measurements Before and After the FFMBI Intervention



Weight and BMI: A statistically significant decrease in body weight was observed (p-value < 0.05), with the mean weight reducing from 54.28 kg to 53.84 kg. This change was correspondingly accompanied by a significant reduction in BMI, decreasing from 22.00 to 21.84 (p-value < 0.05).

Fat Measurements: The total body fat percentage showed a slight, non-significant decrease from 30.17% to 30.04% (p-value = 0.668). Similarly, fat mass decreased marginally from 16.85 kg to 16.55 kg, though this change was not statistically significant (p-value = 0.668).

Muscle and Lean Body Mass: Fat-free mass (FFM) showed a minor, non-significant decrease from 37.43 kg to 37.29 kg (p-value = 0.408). Muscle mass also decreased slightly from 35.34 kg to 35.21 kg, but this change was not statistically significant (p-value = 0.418).

Total Body Water: Both the absolute and relative total body water measurements showed minimal changes. TBW in kilograms decreased slightly from

25.71 kg to 25.68 kg (p-value = 0.864), while TBW percentage increased marginally from 47.66% to 47.86% (p-value = 0.548).

Bone Mass and Metabolic Parameters: Bone mass showed a slight, non-significant decrease from 2.09 kg to 2.08 kg (p-value = 0.380). The metabolic age of participants decreased from 44.33 to 43.63 years, though this change was also not statistically significant (p-value = 0.219).

Visceral Fat and Obesity Measures: The visceral fat rating decreased from 6.03 to 5.87, approaching statistical significance (p-value = 0.057). Notably, the degree of obesity showed a significant change, moving from 0.05% to -0.70% (p-value < 0.05), indicating a shift towards a healthier body composition.

These results demonstrate that while many body composition parameters showed slight improvements, the significant, yet moderate changes were observed in overall body weight, BMI, and the degree of obesity. These findings suggest that the FFMBI program may have a slight positive impact on body composition, particularly in reducing overall body mass and improving obesity-related measures.

4.2.4 Blood Pressure and Heart Rate Measurements

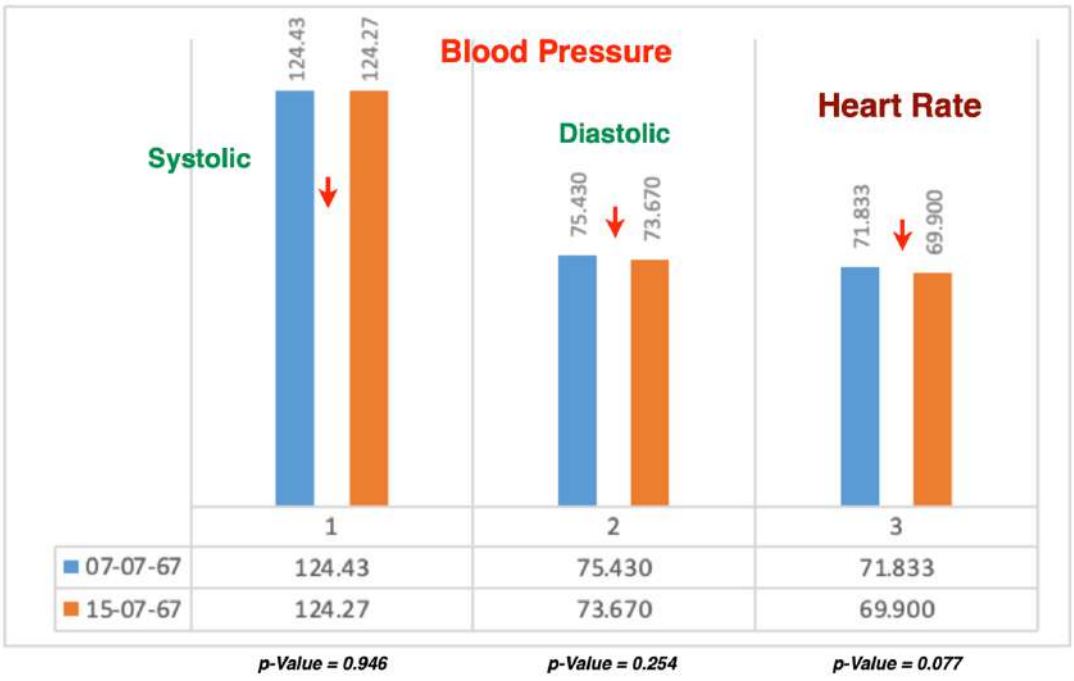
The study measured systolic and diastolic blood pressure, as well as heart rate, before and after the Four Foundations of Mindfulness-Based Intervention (FFMBI). The results are illustrated on Figure 4.4

Systolic Blood Pressure: The mean systolic blood pressure showed a minimal decrease from 124.43 mmHg on July 7, 2024, to 124.27 mmHg on July 15, 2024. This change was not statistically significant (p-value = 0.946).

Diastolic Blood Pressure: The mean diastolic blood pressure decreased from 75.430 mmHg to 73.670 mmHg. However, this reduction was also not statistically significant (p-value = 0.254).

Heart Rate: The average heart rate of participants decreased from 71.833 beats per minute to 69.900 beats per minute. While this represents a noticeable reduction, it did not reach statistical significance (p-value = 0.077).

Figure 4.4 Results of the Blood Pressure and Heart Rate Measurements Before and After the FFMBI Intervention



These results indicate that while there were slight decreases in all three cardiovascular parameters following the FFMBI program, none of these changes were statistically significant. The most pronounced change was observed in the heart rate, which showed a trend towards reduction, albeit not reaching the threshold for statistical significance.

It is important to note that the p-values for all three measurements were above the predetermined significance level of 0.05, indicating that the observed changes could be due to random variation rather than a direct effect of the intervention. However, the consistent downward trend across all three parameters may suggest a potential influence of the FFMBI program on cardiovascular measures that warrants further investigation in larger studies or over longer intervention periods.

4.2.5 Stress Assessment

The study evaluated stress levels, brainwave activity, and cortisol concentrations before and after the Four Foundations of Mindfulness-Based Intervention (FFMBI). The results revealed striking changes across all measured parameters. Stress Level: Participants experienced a substantial and statistically significant reduction in stress levels. The mean self-assessed stress score, decreased from 32.07 on July 7, 2024, to 23.00 on July 15, 2024 (p-value < 0.05). This reduction indicates a very strong improvement in perceived stress following the intervention.

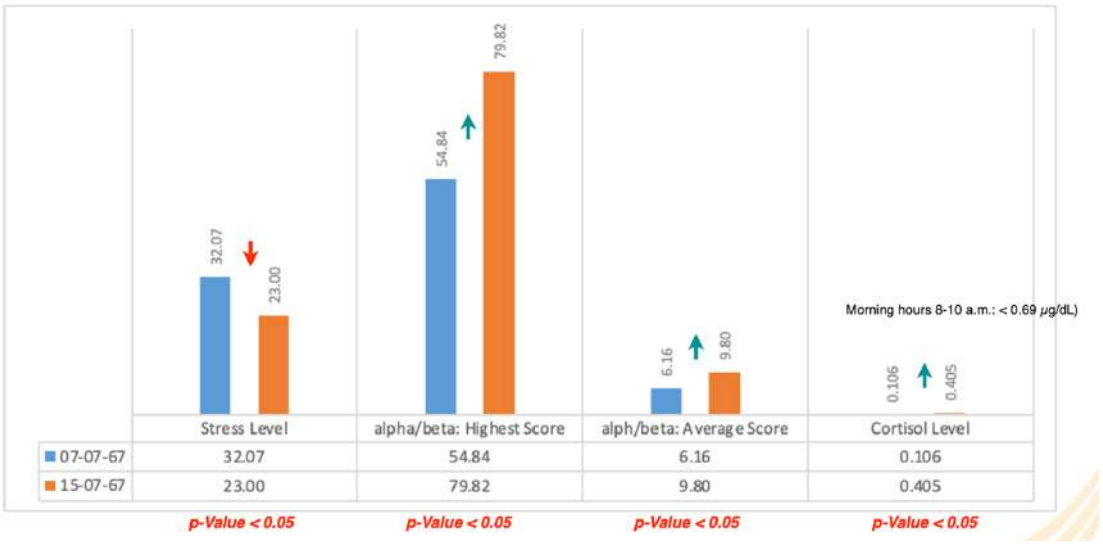
4.2.6 Brainwave Measurement

The results of the brainwave measurements demonstrated a significant enhancement in both the highest and average alpha/beta ratio scores following the intervention. Specifically, the highest alpha/beta ratio score increased substantially from 54.84 to 79.82 (p-value < 0.05), indicating a marked improvement in relaxation and cognitive state. Additionally, the average alpha/beta ratio score rose from 6.16 to 9.80 (p-value < 0.05), further corroborating the positive effects of the FFMBI on brain activity related to relaxation and mental calmness. These findings suggest that the FFMBI intervention has a beneficial impact on brain function, enhancing both relaxation and cognitive performance.

4.2.7 Cortisol Levels

Cortisol Levels: Contrary to the expected outcome, salivary cortisol levels showed a significant increase from 0.106 μg/dL to 0.405 μg/dL (p-value < 0.05). It's noted that the morning hours reference range for cortisol levels is < 0.69 μg/dL, indicating that despite the increase, cortisol levels remained within the normal morning range.

Figure 4.5 Results of the Stress Assessment, Brainwave Measurement and Cortisol Levels Before and After the FFMBI Intervention



4.2.8 Results of Hypotheses Testing

This study tested four main hypotheses regarding the effects of the Four Foundations of Mindfulness-Based Intervention (FFMBI). The outcome for each hypothesis is presented in Table 4.3.

Table 4.3 Results of Hypotheses Testing

Hypothesis	Results
1. FFMBI will significantly decrease salivary cortisol levels and stress.	**Partially supported.** Salivary cortisol levels unexpectedly increased significantly from 0.106 µg/dL to 0.405 µg/dL ($p < 0.05$), although they remained within the normal morning range (< 0.69 µg/dL). However, self-reported stress scores (SPST-20) decreased significantly from 32.07 to 23.00 ($p < 0.05$), indicating strong psychological improvement. This mixed result suggests that perceived stress reduction may not immediately reflect in biochemical stress markers.

Table 4.3 Results of Hypotheses Testing (Cont.)

Hypothesis	Results
2. FFMBI will significantly improve brain wave patterns (increased alpha/beta ratio).	**Supported.** Brainwave analysis showed statistically significant improvement in both the highest alpha/beta ratio score (from 54.84 to 79.82, $p < 0.05$) and the average alpha/beta ratio (from 6.16 to 9.80, $p < 0.05$). These results confirm enhanced relaxation and mental clarity consistent with the FFMBI's meditative objectives.
3. FFMBI will significantly improve body composition (reduced body fat, increased muscle mass).	**Partially supported.** Participants experienced significant reductions in body weight (from 54.28 kg to 53.84 kg, $p < 0.05$), BMI (from 22.00 to 21.84, $p < 0.05$), and degree of obesity (from 0.05% to -0.70%, $p < 0.05$). However, changes in body fat percentage (30.17% to 30.04%, $p = 0.668$) and muscle mass (35.34 kg to 35.21 kg, $p = 0.418$) were not statistically significant.
4. FFMBI will significantly decrease blood pressure and pulse rate.	**Not supported.** While systolic blood pressure (124.43 to 124.27 mmHg), diastolic pressure (75.43 to 73.67 mmHg), and pulse rate (71.83 to 69.90 bpm) showed downward trends, none reached statistical significance ($p > 0.05$). The short duration of the retreat and normal baseline values may have limited the observed effects.

Table 4.3 Results of Hypotheses Testing (Cont.)

Hypothesis	Results
Additional Observation	A statistically significant reduction in perceived stress was observed, highlighting FFMBI's psychological benefits. Participants' SPST-20 scores decreased markedly from 32.07 to 23.00 ($p < 0.05$), indicating enhanced subjective well-being. However, it is important to note that the pre- and post-intervention saliva cortisol measurements were conducted under different conditions, which may have influenced the results. The pre-intervention saliva samples were collected at IBSC around 9:00 a.m., with all participants gathered and supervised by a trained medical technology team. In contrast, the post-intervention saliva samples were collected individually by participants at 3:30 a.m. at the temple on the final retreat day, immediately upon waking, and then submitted to the medical team. This difference in collection time and context may significantly affect cortisol levels due to natural circadian variation. Therefore, the observed increase in cortisol levels (from 0.106 μg/dL to 0.405 μg/dL) may reflect physiological measurement artifacts rather than a true increase in stress—especially since it contrasts sharply with the substantial improvement in psychological stress measured by the self-report tool.

4.2.9 Overall Quantitative Findings

The comprehensive analysis of various physiological and psychological parameters before and after the Four Foundations of Mindfulness-Based Intervention (FFMBI) revealed several significant changes (highlighted in red), summarized in Table 4.4.

Table 4.4 Summary of the Overall Findings of Individual Measurements

No.	Parameter	Sub-parameter	07-07-67	15-07-67	p-Value
1	Blood Pressure	Systolic	124.433	124.270	0.946
2		Diastolic	75.433	73.667	0.254
3	Heart Rate		71.833	69.900	0.078
4	Body Composition (3/12)	Weight (kg)	54.280	53.840	0.001
5		Fat (%)	30.170	30.043	0.668
6		Fat Mass (kg)	16.850	16.550	0.128
7		FFM (kg)	37.430	37.290	0.409
8		Muscle Mass (kg)	35.340	35.213	0.418
9		TBW (kg)	25.710	25.680	0.864
10		TBW (%)	47.663	47.863	0.548
11		Bone Mass (kg)	2.090	2.077	0.380
12		Metabolic Age	44.333	43.633	0.219
13		Visceral Fat Rating	6.033	5.867	0.057
14		BMI	22.003	21.840	0.008
15		Degree of Obesity (%)	0.050	-0.700	0.008
16	Brain Wave Measurement	alpha/beta: Highest Score	54.845	79.821	0.008
17		alpha/beta: Average Score	6.161	9.802	0.002
18	Stress Level		32.067	23.000	0.001
19	Cortisol Level		0.106	0.405	0.000

These results demonstrate that the FFMBI program had the most significant impact on participants' stress levels and brainwave patterns, indicating improved relaxation and mental state. The unexpected increase in cortisol levels, while still within normal morning ranges, warrants further investigation to understand its implications in the context of the intervention.

4.2.10 Participant Feedback and Experiences

The qualitative data collected through interviews with participants of the Four Foundations of Mindfulness-Based Intervention (FFMBI) program provided comprehensive insights into their personal experiences and perceptions. The feedback

was categorized into three main areas: physical changes, mental changes, and application into daily lives.

4.2.10.1 Physical Changes

Participants reported several positive physical changes resulting from the FFMBI program. Improvements in metabolism, reduced body pain, and enhanced sleep quality were frequently mentioned. Some participants noted that their overall physical health felt better, with one participant specifically stating, “I feel my metabolism has improved," and another mentioning, "I feel my body is better and less painful.”

4.2.10.2 Mental Changes

Mentally, participants experienced significant benefits, including increased relaxation, better focus on daily activities, and a noticeable reduction in stress and anxiety. Many participants described feeling calmer, more centered, and better able to manage their emotions. Enhanced mindfulness and a heightened awareness of thoughts, emotions, and bodily sensations were commonly reported. One participant noted, “There is an increase in tranquility, which is very useful in my daily life,” while another stated, “I feel I can focus on my actions better; I always realize what I am doing.”

4.2.10.3 Application into Daily Lives

Participants expressed a strong intention to integrate the mindfulness techniques learned during the program into their daily lives. Several mentioned that they had already started applying these practices and observed positive outcomes. The structured approach of the FFMBI program was appreciated, as it facilitated a deeper engagement with mindfulness practices and promoted sustained well-being. One participant shared, “I use it every day and share it with friends to reduce stress and anxiety,” while another mentioned, “Yes, I will practice meditation every day, including the teachings I have received.”

4.2.10.4 Satisfaction scores

Table 4.5 provides a detailed summary of the satisfaction scores for various aspects of the Four Foundations of Mindfulness-Based Intervention (FFMBI) program. The evaluation levels ranged from 1 (least satisfied) to 5 (most satisfied). The table also includes the average satisfaction scores, the percentage of participants who rated each item as 4 or 5, the standard deviation, and the overall evaluation.

Table 4.5 Satisfaction Scores of the Participants

	Item	Evaluation Levels					n	Average satisfaction	Percentage	S.D.	Evaluation
		5	4	3	2	1					
1	Suitable location: peaceful, clean, and not crowded.	19	10	1			30	4.60	92.00	0.56	Excellent
2	Suitable transportation.	10	16	4			30	4.20	84.00	0.66	Good
3	Suitable conversations: discussing only good topics.	19	10		1		30	4.57	91.33	0.68	Excellent
4	Suitable people: knowledgeable individuals, teachers, and good friends guiding in the right direction.	24	5	1			30	4.77	95.33	0.50	Excellent
5	Suitable food.	14	14	1	1		30	4.37	87.33	0.72	Good
6	Suitable weather: fresh, shady, cool, not too hot or cold.	17	11	2			30	4.50	90.00	0.63	Good
7	Suitable posture: areas arranged for comfortable standing, sitting, and walking.	19	11				30	4.63	92.67	0.49	Excellent
Overall satisfaction								4.52	90.38		
8	In the future, if there is a 15-day meditation course for the research project, would you be interested in joining?	Interested		Not Interested			n		Percentage		
		30					30		100.00		

For the aspect of a suitable location that is peaceful, clean, and not crowded, 19 participants rated this as 5, 10 as 4, and 1 as 3. The average satisfaction score for this item was 4.60, with 92.00% of participants rating it 4 or 5. The standard deviation was 0.56, and the overall evaluation was “Excellent.”

Regarding suitable transportation, 10 participants rated this aspect as 5, 16 as 4, and 4 as 3. The average satisfaction score was 4.20, with 84.00% of participants rating it 4 or 5. The standard deviation was 0.66, and the overall evaluation was “Good.”

For suitable conversations, which involved discussing only good topics, 19 participants rated this aspect as 5, 10 as 4, and 1 as 3. The average satisfaction score was 4.57, with 91.33% of participants rating it 4 or 5. The standard deviation was 0.68, and the overall evaluation was “Excellent.”

Suitable people, including knowledgeable individuals, teachers, and good friends guiding in the right direction, received 24 ratings of 5, 5 ratings of 4, and

1 rating of 3. The average satisfaction score was 4.77, with 95.33% of participants rating it 4 or 5. The standard deviation was 0.50, and the overall evaluation was "Excellent."

Regarding suitable food, 14 participants rated this aspect as 5, 14 as 4, 1 as 3, and 1 as 2. The average satisfaction score was 4.37, with 87.33% of participants rating it 4 or 5. The standard deviation was 0.72, and the overall evaluation was "Good."

For suitable weather, which is fresh, shady, cool, and not too hot or cold, 17 participants rated this aspect as 5, 11 as 4, and 2 as 3. The average satisfaction score was 4.50, with 90.00% of participants rating it 4 or 5. The standard deviation was 0.63, and the overall evaluation was "Good."

Suitable posture, with areas arranged for comfortable standing, sitting, and walking, received 19 ratings of 5 and 11 ratings of 4. The average satisfaction score was 4.63, with 92.67% of participants rating it 4 or 5. The standard deviation was 0.49, and the overall evaluation was "Excellent."

Overall satisfaction with the program was high, with an average satisfaction score of 4.52 and 90.38% of participants rating their experience as 4 or 5. All participants indicated interest in joining a future 15-day meditation course for the research project, with 100.00% expressing interest.

4.3 New Body of Knowledge Obtained from the Research

This research on the Four Foundations of Mindfulness-Based Intervention (FFMBI) has generated significant new knowledge across multiple dimensions. At the **output level**, it led to the development of a structured FFMBI model rooted in canonical Buddhist scriptures and enriched through experiential insights from twelve expert Vipassanā meditation masters and Buddhist scholars. The result is a standardized 7-day retreat program that harmonizes traditional *Satipaṭṭhāna* teachings with contemporary psychological approaches to mental and emotional well-being. Furthermore, the study has produced a clearly defined timetable and set of operational guidelines that can be readily applied or replicated in similar intervention contexts.

At the **outcome level**, the intervention demonstrated measurable psychological improvements among participants, particularly through reductions in self-reported stress and enhancements in brainwave patterns associated with relaxation and cognitive clarity. Additionally, the FFMBI retreat contributed to favorable changes in body composition, underscoring its potential as a holistic approach to mind-body health. This was clearly observed in the study of 30 Thai participants, who not only showed significant improvement in physical and mental indicators but also gave overwhelmingly positive feedback. Many expressed appreciation for the clarity, practicality, and life-changing nature of the program, and reported continued integration of the mindfulness techniques into their daily lives. These outcomes reflect both the scientific validity and spiritual relevance of the FFMBI approach.

In terms of **impact**, this study bridges ancient Buddhist teachings with modern scientific frameworks, providing a credible model for advancing mental health initiatives in Thailand and beyond. The FFMBI program stands as a pioneering contribution to national efforts in developing culturally grounded yet evidence-based mindfulness interventions. Importantly, this research and its publications serve as a vehicle for transmitting the timeless wisdom of the Buddha to broader communities—both academic and lay—through a format that resonates with today's evidence-driven world. Its replicability across healthcare, education, and community wellness sectors further enhances its value. Given these achievements, the FFMBI research presents a compelling case for recognition at the national level, particularly in the fields of mental health, Buddhist psychology, and innovative mindfulness-based solutions.

Chapter 5

Conclusions, Discussions of the Research Results and Recommendations

This chapter summarizes the key findings from the study on the Four Foundations of Mindfulness-Based Intervention (FFMBI), discusses the implications of the research results, and presents recommendations for policy, practice, and future research. The chapter begins with conclusions drawn from both the quantitative and qualitative data analyses, followed by a critical discussion of the findings in relation to existing literature, theoretical frameworks, and practical applications. Finally, strategic recommendations are provided to guide policymakers, practitioners, and researchers in applying and extending the FFMBI model. The overall aim of this chapter is to reflect on the significance and impact of the study and to suggest pathways for maximizing its benefits in both academic and practical contexts.

5.1. Conclusion

5.1.1 Qualitative Study

Based on the research findings and the development of the Four Foundations of Mindfulness-Based Intervention (FFMBI), the following conclusion can be drawn. This study has successfully developed a comprehensive FFMBI program that integrates the principle of the Four Foundations of Mindfulness in Buddhist teachings with contemporary understanding of psychological and mental well-being. By thoroughly examining the Four Foundations of Mindfulness as presented in the *Pāli* Canon and incorporating insights from experienced *Vipassanā* Meditation Masters and Buddhist scholars, the research has created a robust framework for mindfulness practice that remains true to its roots while being applicable in modern contexts. The FFMBI program, with its recommended minimum duration of seven days and carefully structured components, offers a promising approach to enhancing psychological and mental well-being. The integration of alternating sitting and walking meditation,

mindful contemplation of daily activities, regular meditation interviews, and daily Dhamma talks provides a holistic framework for cultivating mindfulness and insight.

This research contributes to the growing field of mindfulness-based interventions by offering a more authentic and comprehensive approach that fully incorporates the depth and breadth of the *Satipaṭṭhāna* practice. The developed FFMBI program has the potential to provide practitioners with a deeper and more transformative experience compared to more secularized mindfulness interventions. However, it is important to note that while this study has laid a strong theoretical and structural foundation for the FFMBI program, further research is needed to empirically validate its effectiveness. Future studies should focus on implementing and evaluating the program in various settings, measuring its impact on different aspects of psychological and mental well-being, and comparing its outcomes with other established mindfulness-based interventions. In conclusion, the development of this FFMBI program represents a significant step towards bridging ancient Buddhist wisdom with contemporary psychological practice. It offers a promising path for individuals seeking to enhance their well-being through a more authentic and comprehensive approach to mindfulness practice. As mindfulness continues to gain prominence in mental health and well-being discourse, this research provides a valuable contribution to the field, opening new avenues for both practice and further study.

5.1.2 Quantitative Study

This study provides compelling evidence for the multifaceted effects of the Four Foundations of Mindfulness-Based Intervention (FFMBI) on both physiological and psychological parameters. The findings demonstrate significant improvements in perceived stress levels, brainwave patterns associated with relaxation and cognitive function, and certain aspects of body composition. These results suggest that FFMBI has the potential to be an effective tool for stress management, cognitive enhancement, and overall well-being.

The observed reductions in body weight, BMI, and degree of obesity, although modest, indicate that FFMBI may have positive implications for weight management and metabolic health. The significant improvements in brainwave activity,

particularly the increased alpha/beta ratios, provide objective evidence of the intervention's impact on mental states conducive to relaxation and focused attention.

While some findings, such as the increase in cortisol levels, were unexpected and warrant further investigation, they highlight the complex nature of mind-body interventions and the need for more comprehensive, long-term studies. The qualitative feedback from participants further supports the beneficial effects of FFMBI, emphasizing improvements in both physical and mental well-being, and indicating a strong likelihood of continued practice.

However, the limitations of this study, including its short duration and gender imbalance in the sample, underscore the need for more extensive research. Future studies should aim to include larger, more diverse samples over longer periods to better understand the long-term effects and sustainability of FFMBI benefits.

In conclusion, this research contributes valuable insights to the growing body of evidence supporting mindfulness-based interventions. The FFMBI program shows promise as a holistic approach to improving both mental and physical health. As we continue to face increasing stress and health challenges in modern society, interventions like FFMBI may play a crucial role in promoting overall well-being and quality of life. Further research in this area has the potential to refine our understanding of mindfulness practices and their applications in both clinical and non-clinical settings.

The results of this study not only affirm the quantitative outcomes of the FFMBI intervention but also underscore the richness of qualitative insights gathered from both expert informants and participants. These perspectives provide a deeper understanding of how the FFMBI program fosters transformation at multiple levels—structural, physical, mental, and behavioral. To visually summarize these findings, the following thematic map (Figure 5.1) illustrates the core elements derived from in-depth interviews. It captures the interconnected themes of program structure and effectiveness, physical and mental health improvements, and the integration of mindfulness into daily life, reflecting the holistic and practical impact of the FFMBI intervention.

Figure 5.1 FFMBI Thematic Map

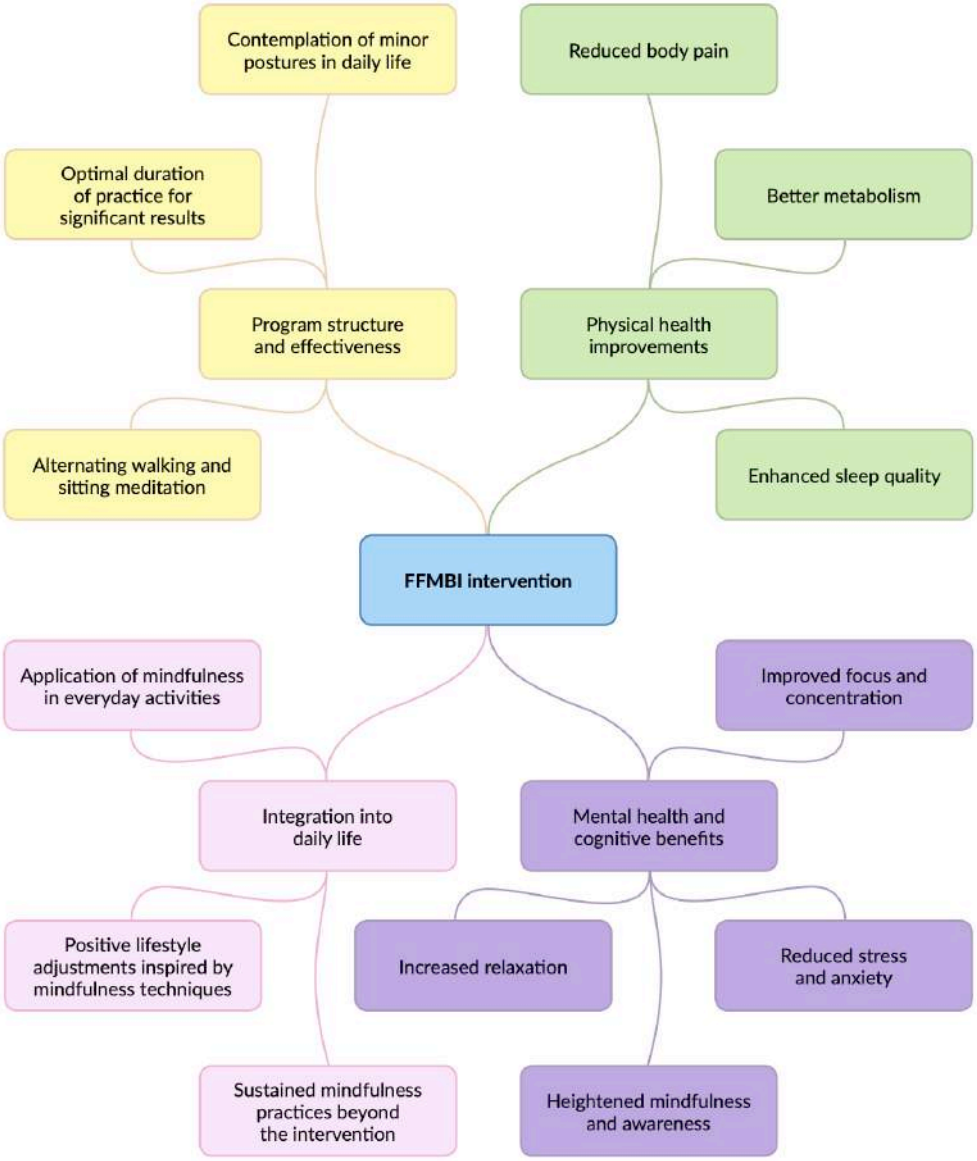


Figure 5.1 Thematic map illustrating key themes derived from qualitative interviews with key informants (yellow) and participants (green, pink and purple). Themes include program structure and effectiveness, physical and mental health improvements, and the integration of mindfulness practices into daily life.

5.2 Discussion of the Research Results

5.2.1 Demographic Characteristics and Participant Engagement

The demographic profile of our study participants provides valuable insights into the Four Foundations of Mindfulness-Based Intervention (FFMBI) program. The overwhelming female representation (97%) in our sample raises important questions about gender differences in seeking mindfulness-based interventions. This skew towards female participants is consistent with previous research on mindfulness and meditation programs, which often report higher female engagement.1 Future studies should explore strategies to increase male participation and investigate potential barriers that may discourage men from engaging in such programs.

The wide age range of participants (36-75 years) demonstrates the broad appeal of FFMBI across different life stages. The higher representation in the 51-75 age brackets suggests that the program may be particularly attractive to older adults, possibly due to increased free time in retirement or a greater interest in health and wellness practices later in life. This finding aligns with research indicating that older adults often show more interest in mindfulness practices for managing age-related stressors and improving overall well-being.2

During the study, all participants completed the 7-day program. This suggests that FFMBI was well-received by participants and did not pose significant barriers to completion. However, it's important to consider potential selection bias; those who volunteered for the study may have had prior meditation experience and may been more motivated or had fewer barriers to participation than the general population.

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[1] Katz, D., & Toner, B., "A Systematic Review of Gender Differences in the Effectiveness of Mindfulness-Based Treatments for Substance Use Disorders," *Mindfulness*, Vol. 4, No. 4 (2013): 318–331.

[2] Geiger, P. J., Boggero, I. A., Brake, C. A., Caldera, C. A., Combs, H. L., Peters, J. R., & Baer, R. A., "Mindfulness-Based Interventions for Older Adults: A Review of the Effects on Physical and Emotional Well-Being," *Mindfulness*, Vol. 7, No. 2 (2016): 296–307.

These demographic findings have important implications for the design and implementation of future mindfulness-based interventions. They highlight the need for targeted outreach to underrepresented groups, particularly men and younger adults, to ensure that the benefits of such programs are accessible to a more diverse population. Additionally, the high engagement of older adults suggests that FFMBI could be particularly valuable in promoting healthy aging and could be integrated into programs specifically tailored for this demographic.

Future research should aim to understand the factors contributing to the gender imbalance and age distribution observed in this study. This could involve qualitative research to explore motivations for participation and barriers to engagement across different demographic groups. Such insights would be crucial in developing more inclusive and widely appealing mindfulness-based interventions.

5.2.2 Cardiovascular Effects of FFMBI

The results from our blood pressure and heart rate measurements following the Four Foundations of Mindfulness-Based Intervention (FFMBI) program present an interesting picture of the intervention's impact on cardiovascular function. While the changes observed were not statistically significant, they warrant careful consideration and interpretation.

The marginal nature of these changes could be attributed to several factors. First, the relatively short duration of the intervention (7 days) may not have been sufficient to induce substantial changes in blood pressure, which often require longer periods to manifest measurable differences. Additionally, the baseline blood pressure readings of our participants were already within the normal range, potentially limiting the scope for significant reductions.

The trend towards a decrease in heart rate, while also not statistically significant, is particularly interesting. This reduction, from 71.833 to 69.900 beats per minute, approaches the threshold of significance ($p = 0.077$) and suggests a potential effect of FFMBI on autonomic nervous system function.

The lack of statistical significance in these cardiovascular measures does not necessarily negate the clinical relevance of the observed trends. Small changes in blood

pressure and heart rate, if sustained over time, can have meaningful impacts on long-term cardiovascular health.[3] Moreover, individual variability in response to mindfulness interventions is well-documented, and group-level statistics may mask significant benefits experienced by some participants.

These findings highlight the need for longer-term studies with larger sample sizes to better elucidate the cardiovascular effects of FFMBI. Future research should consider incorporating more frequent measurements throughout the intervention period to capture the temporal dynamics of these changes. Additionally, including participants with pre-existing hypertension or other cardiovascular risk factors could provide insights into the potential therapeutic applications of FFMBI in clinical populations.

5.2.3 Body Composition Changes in Response to FFMBI

The changes observed in body composition following the Four Foundations of Mindfulness-Based Intervention (FFMBI) program offer intriguing insights into the potential physiological effects of mindfulness practices. The most notable findings were the statistically significant reductions in body weight, BMI, and degree of obesity, which suggest that FFMBI may have a positive impact on overall body composition.

The significant decrease in body weight, albeit small in magnitude, is particularly interesting given the short duration of the intervention. This change could be attributed to several factors. Mindfulness practices have been associated with increased body awareness and improved eating behaviors.[4] Participants may have become more attuned to their bodies' needs, potentially leading to more mindful eating habits and subtle changes in energy balance. Additionally, the stress reduction effects of FFMBI, as evidenced by our stress level measurements, could have contributed to decreased stress-related eating or changes in metabolism. Also, participants followed

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[3] Cook, N. R., Cohen, J., Hebert, P. R., Taylor, J. O., & Hennekens, C. H., "Implications of Small Reductions in Diastolic Blood Pressure for Primary Prevention," *Archives of Internal Medicine*, Vol. 155, No. 7 (1995): 701–709.

[4] Tapper, K., "Can Mindfulness Influence Weight Management Related Eating Behaviors? If So, How?," *Clinical Psychology Review*, Vol. 53 (2017): 122–134.

the Buddhist eight precepts during the program, which entails refraining from eating after noon. This practice is a likely contributing factor to the observed changes related to weight.

The significant improvement in BMI and degree of obesity, while mathematically linked to the weight loss, reinforces the potential of FFMBI as a tool for weight management. These findings align with emerging research suggesting that mindfulness-based interventions can be effective adjuncts to traditional weight loss programs.[5]

The non-significant changes in other body composition parameters, such as fat percentage, muscle mass, and total body water, are not surprising given the short intervention period. Body composition changes typically require more time to manifest measurably. However, the trending decrease in visceral fat rating, approaching statistical significance, is noteworthy. Visceral fat is particularly associated with metabolic health risks, and its reduction, even if slight, could have important health implications.[6]

It is important to interpret these results cautiously. The observed changes, while statistically significant, are relatively small in magnitude. The short duration of the study limits our ability to predict long-term effects or sustainability of these changes. Moreover, we cannot rule out the influence of other factors, such as potential changes in diet or physical activity that may have occurred concurrently with the FFMBI program.

These findings open up several avenues for future research. Longer-term studies are needed to assess the sustainability of these body composition changes and

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[5] Carrière, K., Khoury, B., Günak, M. M., & Knäuper, B., "Mindfulness-Based Interventions for Weight Loss: A Systematic Review and Meta-Analysis," *Obesity Reviews*, Vol. 19, No. 2 (2018): 164–177.

[6] Shuster, A., Patlas, M., Pinthus, J. H., & Mourtzakis, M., "The Clinical Importance of Visceral Adiposity: A Critical Review of Methods for Visceral Adipose Tissue Analysis," *British Journal of Radiology*, Vol. 85, No. 1009 (2012): 1–10.

to explore whether more pronounced effects emerge over time. Investigation into the mechanisms underlying these changes would be valuable, particularly examining the relationships between mindfulness, stress reduction, eating behaviors, and metabolic processes.

5.2.4 Stress Response to FFMBI

The results from our stress assessment, brainwave measurements, and cortisol analysis present a complex and intriguing picture of the physiological and psychological effects of the Four Foundations of Mindfulness-Based Intervention (FFMBI). The significant reduction in self-assessed stress levels aligns with the well-established stress-reducing effects of mindfulness practices.[7] This decrease suggests that FFMBI was effective in helping participants manage their perceived stress, which could have far-reaching implications for mental health and overall well-being. The magnitude of this reduction over a relatively short intervention period is particularly noteworthy and speaks to the potential efficacy of FFMBI as a stress management tool.

5.2.5 Brainwave Activity Response to FFMBI

The brainwave measurements provide compelling evidence for the neurophysiological impact of FFMBI. The significant increases in both the highest and average alpha/beta ratios indicate a shift towards a more relaxed and focused mental state. Higher alpha/beta ratios are associated with increased relaxation, improved attention, and enhanced cognitive processing.[8] These findings suggest that FFMBI may not only reduce subjective feelings of stress but also induce measurable changes in brain activity conducive to improved mental functioning.

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[7] Khoury, B., Sharma, M., Rush, S. E., & Fournier, C., "Mindfulness-Based Stress Reduction for Healthy Individuals: A Meta-Analysis," *Journal of Psychosomatic Research*, Vol. 78, No. 6 (2015): 519–528.

[8] Putman, P., Verkuil, B., Arias-Garcia, E., Pantazi, I., & van Schie, C., "EEG Theta/Beta Ratio as a Potential Biomarker for Attentional Control and Resilience Against Deleterious Effects of Stress on Attention," *Cognitive, Affective, & Behavioral Neuroscience*, Vol. 14, No. 2 (2014): 782–791.

5.2.6 Cortisol Response to FFMBI

The cortisol results, however, present an unexpected finding. The significant increase in salivary cortisol levels seems to contradict the observed reductions in stress and improvements in brainwave patterns. While cortisol is often referred to as the "stress hormone," its function is more complex. Cortisol follows a diurnal rhythm, with levels typically highest in the morning and decreasing throughout the day.[9] At the start of the 7-day program, salivary samples were collected from participants between 9. a.m. and 10 a.m., while at the end of the program, samples were collected just after 3 a.m. just after the morning bell.

However, future research should aim to clarify the relationship between subjective stress reduction, brainwave changes, and cortisol responses in the context of mindfulness practices. Longitudinal studies with more frequent cortisol sampling throughout the day could provide a more comprehensive understanding of how FFMBI affects the entire diurnal cortisol rhythm. Additionally, investigating other biomarkers of stress and well-being alongside cortisol could offer a more nuanced picture of the physiological effects of FFMBI.

5.2.7 Comprehensive Analysis of FFMBI Effects

The overall results of our study on the Four Foundations of Mindfulness-Based Intervention (FFMBI) reveal a multifaceted impact on participants' physiological and psychological parameters, providing a nuanced understanding of the intervention's effects.

This research on FFMBI reveals a complex picture of its effects on various physiological and psychological measures. While cardiovascular changes were not statistically significant, there were notable improvements in body composition, particularly in weight and BMI. Brain wave activity showed significant enhancements in alpha/beta scores, indicating improved relaxation and cognitive states. The reduction

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[9] Adam, E. K., Quinn, M. E., Tavernier, R., McQuillan, M. T., Dahlke, K. A., & Gilbert, K. E., “Diurnal Cortisol Slopes and Mental and Physical Health Outcomes: A Systematic Review and Meta-Analysis,” *Psychoneuroendocrinology*, Vol. 83 (2017): 25–41.

in perceived stress levels was a key finding, although it was paradoxically accompanied by an increase in cortisol levels. These results suggest that FFMBI has potential benefits for stress reduction and cognitive function, with some impact on body composition. However, the mixed findings, particularly regarding cortisol levels, underscore the complexity of mindfulness interventions' effects on the body and mind, pointing to the need for further research to fully understand the mechanisms and long-term impacts of such practices.

These comprehensive findings have several important implications:

1. Holistic Impact: FFMBI appears to have wide-ranging effects on both mind and body, supporting its potential as a holistic health intervention.

2. Individual Variability: The diverse range of outcomes highlights the need to consider individual differences in response to mindfulness interventions.

3. Mechanism Exploration: The results call for deeper investigation into the mechanisms by which mindfulness practices influence various physiological systems and psychological phenomenon.

4. Clinical Applications: The positive changes in body composition and stress levels suggest potential applications of FFMBI in weight management and stress-related disorders.

5. Measurement Complexity: The study underscores the importance of using multiple assessment methods to capture the full spectrum of mindfulness effects.

In conclusion, while some results align with expectations, others challenge our understanding of mindfulness effects, highlighting the complex and multifaceted nature of mind-body interventions. This study lays the groundwork for future investigations into the mechanisms and applications of FFMBI in promoting holistic health.

5.2.8 Participant Feedback and Experiences

The qualitative insights from participant interviews offer a deeper understanding of the Four Foundations of Mindfulness-Based Intervention (FFMBI) program's impact, complementing the quantitative data. These findings reveal the

program's effectiveness in enhancing physical, mental, and emotional well-being, aligning with the observed reductions in self-assessed stress levels and improvements in brainwave activity.

5.2.8.1 Physical Changes

Participants' reports of physical health improvements align with the quantitative findings of slight but significant reductions in body weight and BMI. The improvements in metabolism, reduced body pain, and better sleep quality suggest that the FFMBI program positively affects physical health. These physical benefits contribute to the overall well-being of participants and support the program's potential to foster a positive mind-body connection.

5.2.8.2 Mental Changes

The mental benefits reported by participants, including increased relaxation, better focus, and reduced stress and anxiety, reinforce the significant reductions in self-assessed stress levels and the enhancements in brainwave activity observed in the study. These improvements in mental clarity, emotional stability, and mindfulness indicate that the FFMBI program effectively promotes mental well-being. The heightened awareness of thoughts, emotions, and bodily sensations further supports the program's ability to enhance mindfulness and overall mental health.

5.2.8.3 Application into Daily Lives

The intention of participants to integrate mindfulness techniques into their daily lives highlights the program's sustainability and practical applicability. This intention is crucial for maintaining the benefits of mindfulness interventions over the long term. Participants' feedback suggests that the FFMBI program equips individuals with effective tools to manage stress and enhance well-being in their everyday routines. The positive outcomes observed from the application of mindfulness practices in daily life underscore the program's real-world applicability and potential for sustained impact.

5.3 Recommendations

While this study provides valuable insights into the effects of FFMBI, several limitations should be acknowledged. The short duration of the intervention and the relatively small sample size limit the generalizability of our findings. The gender imbalance in our sample also restricts our ability to draw conclusions about the effectiveness of FFMBI across different demographic groups.

Future research should address these limitations by conducting longer-term studies with larger, more diverse samples. Additionally, investigating the mechanisms underlying the observed changes would be valuable, particularly examining the relationships between mindfulness, stress reduction, eating behaviors, and metabolic processes. Exploring the potential therapeutic applications of FFMBI in clinical populations, such as individuals with hypertension or obesity, could provide insights into its efficacy as a complementary treatment approach.

In conclusion, this study provides evidence for the multifaceted impact of FFMBI on both physiological and psychological parameters. The findings suggest that FFMBI has potential benefits for stress reduction, cognitive function, and body composition. However, the mixed results, particularly regarding cortisol levels, underscore the complexity of mindfulness interventions' effects on the body and mind. These results lay the groundwork for future investigations into the mechanisms and applications of FFMBI in promoting holistic health.

5.3.1 Policy Recommendations

5.3.1.1 Integration into National Mental Health Strategy: The Ministry of Public Health and related agencies should consider incorporating FFMBI as a complementary approach within Thailand's national mental health programs. Its emphasis on non-pharmacological stress reduction aligns well with preventative health models and can support national well-being initiatives.

5.3.1.2 Institutional Endorsement of Mindfulness-Based Training: Educational and healthcare institutions should be encouraged to endorse mindfulness-based programs such as FFMBI, especially those grounded in Buddhist principles, for enhancing cognitive performance, emotional regulation, and occupational stress resilience.

5.3.1.3 Recognition of Traditional Knowledge in Modern Health Systems: Policymakers should promote the integration of evidence-based Buddhist psychological interventions into Thailand's health innovation framework. This would support cultural preservation while advancing mental health policy through scientifically validated traditional practices.

5.3.2 Recommendations for Implementing the Research Results

5.3.2.1 Pilot Programs in Schools, Universities, and Workplaces: The standardized 7-day FFMBI retreat model developed in this study can be piloted in universities, healthcare centers, and corporate wellness programs. Adapted versions can be created for shorter durations (e.g., 3–5 days) with pre- and post-assessment to measure impact.

5.3.2.2 Training for Certified Mindfulness Facilitators: Institutions can use the FFMBI framework to develop certification programs for mindfulness facilitators, ensuring consistent delivery based on doctrinal authenticity and scientific grounding.

5.3.2.3 Use of FFMBI as a Therapeutic Support Tool: Healthcare providers, especially in mental health, chronic disease, and rehabilitation contexts, may adopt FFMBI as a complementary therapy to support patients' emotional regulation, sleep improvement, and body-mind awareness.

5.3.2.4 Dissemination of Educational Materials and Research Findings: Research publications, infographics, and public seminars should be used to share the FFMBI model and outcomes with broader communities, thus spreading the wisdom of the Buddha's teachings in an accessible, evidence-based format.

5.3.3 Recommendations for Further Research

5.3.3.1 Long-Term and Larger-Scale Studies: Future research should examine the long-term effects of FFMBI through multi-week interventions and larger sample sizes that include diverse demographic backgrounds (gender, age, occupation, and health status).

5.3.3.2 Comparative Studies with Clinical Populations: Investigate FFMBI's therapeutic applications for individuals with hypertension, obesity, anxiety disorders, or stress-related health conditions. Randomized controlled trials comparing FFMBI with other interventions (e.g., MBSR, MBCT) would be valuable.

5.3.3.3 Mechanism-Oriented Studies: Explore the biological and psychological mechanisms underlying FFMBI's impact, particularly the discrepancy observed between physiological markers (e.g., cortisol levels) and subjective reports of stress. Control for factors such as time and location of biomarker sampling is essential.

5.3.3.4 Technology-Enhanced Delivery Models: Develop digital or hybrid formats of the FFMBI program (e.g., guided mobile apps, AI chatbots based on Buddhist psychology) to increase accessibility for working populations and international audiences.

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Appendix

Appendix A
Research Ethics Certificates

Research Ethics Certificate for Research Proposal,

explanatory information document about research participants and the consent letters

R. 264 / 2024

This research proposal and the supporting documents listed below have been reviewed by the Research Ethics Committee, Mahachulalongkornrajavidyalaya University. The committee stated that this research proposal is aligned with the International Code of Ethics, national law and regulatory requirements, therefore it was appropriate to continue the research according to this proposal.

Title of Proposal: Effects of Four Foundations of Mindfulness- Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners

Research Proposal Code: -

Institution: International Buddhist Studies College, Mahachulalongkornrajavidyalaya University

Researcher: Dr.Nadnapang Phophichit

List of documents that have been reviewed:

1. Research Proposal version April 19, 2024
2. Explanatory document about research participation version April 19, 2024
3. Letter of consent to participate in the research version April 19, 2024
4. Data collection method version April 19, 2024

Ven. Assoc. Prof. Dr. Phramaha Somboon Vuddhikaro

President of Research Ethics Committee

Mahachulalongkornrajavidyalaya University

May 9, 2024

Certification Number: R. 263 / 2024

Certified Date: May 9, 2024

Certificate Expiration Date: May 9, 2025

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Ref: MCU 8007/R.264

9th May 2024

Subject Certification of Research Ethics for Research Proposals

To Dr.Nadnapang Phophichit / The Researcher of International Buddhist Studies College, Mahachulalongkornrajavidyalaya University

As you have requested a research ethics certificate for the thesis research on "Effects of Four Foundations of Mindfulness- Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners", at International Buddhist Studies College, Mahachulalongkornrajavidyalaya University.

The Research Ethics Committee stated that this research proposal is consistent with international codes of ethics, national laws and regulations, therefore it is expedient to continue this research without amendment.

Please be informed accordingly for further arrangement.

Regards,

(Ven. Assoc. Prof. Dr. Phramaha Somboon Vuddhikaro)
The Chair of Research Ethics Committee
Mahachulalongkornrajavidyalaya University

Appendix B

Informed Consent Form for Research Participations

Informed consent form for research participants (age 20 years or older)
Research Project Titled: "Effects of Four Foundations of Mindfulness- Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners" has been approved by the Human Research Ethics Committee of the Buddhist Research Institutes, Mahachulalongkornrajavidyalaya University
Project Approval Code: R.263/2024 Date of Approval: May 9, 2024

Informed Consent Form for Research Participants

Date..... /...../.....

I,.....age....., residing at..... Sub-district.....District.....
Province..... Postal Code..... Phone Number.....

Hereby express my willingness to participate in the research project "Effects of Four Foundations of Mindfulness- Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners"

I have been fully informed of the details of the research project, its benefits, and the potential risks involved. I understand everything clearly and agree to participate in the project mentioned above. I am aware that I can inquire about any questions or concerns from the researcher at any time and can withdraw from the research project without any consequences. Furthermore, the researcher will keep my personal data confidential and disclose it only in a summarized form for research outcomes. The disclosure of personal information to related agencies will be done only when necessary for academic reasons.

Therefore, I give my consent to Dr. Nadnapang Phophichit, Director of the Master of Arts in Peace Studies Program (International Program) and a lecturer at the International Buddhist Studies College (IBSC), Mahachulalongkornrajavidyalaya University (MCU), to collect data for the research project titled 'Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners'.

Participant's Signature .....
Date..... /...../.....

Researcher's Explanation

I have clearly explained all aspects of the research project to the participant, including its purpose, benefits, and any potential risks.

Researcher's Signature .....
(Dr. Nadnapang Phophichit)
Date..... /...../.....

Appendix C

Research Tools

(In-depth & Post- Intervention Interview Questions)

Interview Form for Key Informants

This form consists of 3 sections:

1. General information of the interviewee
2. Questions related to the research
3. Additional suggestions

Section 1: General Information of the Interviewee

Name and Surname: .....

Position/Title: .....

Workplace Address: .....

.....

.....

Age: ..... Religion: ..... Gender: □ Male □ Female

Home Address: .....

.....

.....

Phone Number: .....

E-mail: ..... Line ID: .....

Date of providing information: .....

Section 2: Questions Related to Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners

Key informants are categorized into 3 groups:

Group 1: *Vipassanā* Meditation Masters (To develop FFMBI)
Group 2: Buddhist Scholars/ Experts in Buddhism (To develop FFMBI)
Group 3: Experimental group of 30 practitioners. (Post-Intervention Interview)

Questions for Groups 1 - 2:

1.1 What do you think is the appropriate duration for a Four Foundations of Mindfulness-Based Intervention (FFMBI) for new practitioners, to induce physical and mental changes?

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1.2 What do you think the structure of Four Foundations of Mindfulness-Based Intervention (FFMBI) should be, including sitting meditation, walking meditation, and other minor posture practices? What should be the duration for each practice within a day? (Please explain with examples)

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1.3 Based on question 1.2, what additional activities do you think should be included? (Please explain with examples, such as meditation interviews, Dhamma talks on specific topics each day, supporting Dhamma principles, experiences of meditation masters, Buddhist scriptures)

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1.4 What do you think are the supporting Dhamma principles, and obstructive principles for practicing *Vipassanā* meditation based on the four foundations of mindfulness? (Please explain with examples)

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Group 4: Experimental group of 30 practitioners

1.1 After receiving the Four Foundations of Mindfulness-Based Intervention (FFMBI) for 7 consecutive days, what physical changes have you noticed?

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1.2 After receiving the Four Foundations of Mindfulness-Based Intervention (FFMBI) for 7 consecutive days, what mental changes have you noticed?

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1.3 How do you plan to integrate the knowledge and experience gained from the FFMBI intervention into your daily life?

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Section 3: Additional Suggestions

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Meditation Course Evaluation Form

for the Research Project according to things favorable to mental development

Research Project: Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners)

Date: 8-15 July 2024 (7 days)

Location: Wat Bhaddanta Asabharam, Nong Phai Kaeo , Ban Bueng Chonburi, Thailand

Instructions: Please place a / mark in the box that corresponds to your opinion in only one box.

No.	Question Items	Evaluation Levels				
		Excellent	Good	Fair	Poor	Need Improvement
1.	Suitable location: peaceful, clean, and not crowded.					
2.	Suitable transportation.					
3.	Suitable conversations: discussing only good topics.					
4.	Suitable people: knowledgeable individuals, teachers, and good friends guiding in the right direction.					
5.	Suitable food.					
6.	Suitable weather: fresh, shady, cool, not too hot or cold.					
7.	Suitable posture: areas arranged for comfortable standing, sitting, and walking.					

8. In the future, if there is a 15-day meditation course for the research project, would you be interested in joining? ☐ Interested ☐ Not Interested

9. Suggestion

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Appendix D
List of Key-Informants

Group	No.	Name	Position	Temple/ Institution/ University
Vipassanā Meditation Master	1.	Phra Brahmawatcharavimonmuni Vi., Assoc. Prof. Dr. (*Pāli* IX)	Director, *Vipassanā* Meditation Master	*Vipassanādhura* Institute, Mahachulalongkornrajavidyalaya University, Thailand
	2.	Phra Ajahn Somparn Sompharo	*Vipassanā* Meditation Master	Wat Mahathat Yuwaratrangsarit, Bangkok Thailand
	3.	Phrakru Bhavanasarapundit, Dr.	*Vipassanā* Meditation Master	Mahachulalongkornrajavidyalaya University, Thailand
	4.	Phramaha Pairod Nyanakusal (*Pāli* IX)	Director, Lecturer	Abhidhammajotika College, Mahachulalongkornrajavidyalaya University, Thailand
	5.	Phra Ajahn Amnaj Khantiko,	Vice Abbot, *Vipassanā* Meditation Master	Wat Bhanddanta Asabharam
	6.	Phra Medhivajarapundit, Prof. Dr. (*Pāli* VI)	Director, *Vipassanā* Meditation Master	International Buddhist Studies College (IBSC), Mahachulalongkornrajavidyalaya University, Thailand
Buddhist Scholars	7.	Dr. Gábor KARSAI	Rector	Dharma Gate Buddhist College (DGBC), Budapest, Hungary
	8.	Péter GYŐRI	Study Director, Lecturer	
	9.	Zoltán CSER	Lecturer	
	10.	Asst. Prof. Dr. Norbert NÉMETH	Lecturer	
	11.	Asst. Prof. Melinda FÖLDINÉ IRTL	Lecturer	
	12.	Ferenc BODÓ, Lecturer	Lecturer	

Appendix E
Permission Letters for Collecting Research Data

No. 003/2024

MAHACHULALONGKORNRAJAVIDYALAYA UNIVERSITY
79 Group 1 Lamsai, Wang Noi,
Ayutthaya 13170, Thailand
Tel. (6635) 248-000-5
Fax (6635) 248-034
URL: www.mcu.ac.th

25 April 2024

Dr. Gábor Karsai
Rector
Dharma Gate Buddhist College
Börzsöny street 11.
Budapest, Hungary 1098

Dear Dr. Gábor Karsai
Subject: Kind request for research data collection
Enclosed: Interview form 1 copy

We hope this letter finds you well. I am Dr. Nadnapang Phophichit, Director of Master of Arts in Peace Studies Program (International Program) at International Buddhist Studies College, MCU. As the project head, along with my team, I am currently conducting research titled "***Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure, Pulse rate, and Brain Waves of Practitioners.***"

We are eager to include your valuable insights in this research. I would like to schedule a face-to-face interview with you and 2-5 other lectures of Dharma Gate Buddhist College to collect data from your perspectives for research mentioned above between May 21-31, 2024, at a mutually agreed time and place. Enclosed with this letter are the interview details and the interview form. Your participation would be greatly appreciated, and we are hopeful that you can accommodate this request in your schedule.

Should you have any questions or require further information about the research, please do not hesitate to contact me via email at nadnapang@ibsc.mcu.ac.th or by Mobile at (+66) 655 199 556. I would be more than delighted to provide any additional details you may need.

Thank you very much for considering this request. Your expertise and time are highly valued, and I look forward to the possibility of conducting this interview with you.

Yours sincerely in the Dhamma,

(Dr. Nadnapang Phophichit)
Director of Master of Arts in Peace Studies Program,
International Buddhist Studies College
Head of Research Project

No. 004/2024

MAHACHULALONGKORNRAJAVIDYALAYA UNIVERSITY
79 Group 1 Lamsai, Wang Noi,
Ayutthaya 13170, Thailand
Tel. (6635) 248-000-5
Fax (6635) 248-034
URL: www.mcu.ac.th

9 May 2024

Melinda FÖLDINÉ IRTL
Lecturer
Dharma Gate Buddhist College
Börzsöny street 11.
Budapest, Hungary 1098

Dear Melinda FÖLDINÉ IRTL
Subject: Kind request for research data collection
Enclosed: Interview form 1 copy

We hope this letter finds you well. I am Dr. Nadnapang Phophichit, Director of Master of Arts in Peace Studies Program (International Program) at International Buddhist Studies College, MCU. As the project head, along with my team, I am currently conducting research titled "***Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure, Pulse rate, and Brain Waves of Practitioners.***"

We are eager to include your valuable insights in this research. I would like to schedule a face-to-face interview with you to collect data from your perspectives for research mentioned above on May 23rd (Thursday), 2024 at 16:30-18:00 CEST at Dharma Gate Buddhist College. Enclosed with this letter are the interview details and the interview form. Your participation would be greatly appreciated, and we are hopeful that you can accommodate this request in your schedule.

Should you have any questions or require further information about the research, please do not hesitate to contact me via email at nadnapang@ibsc.mcu.ac.th or by Mobile at (+66) 655 199 556. I would be more than delighted to provide any additional details you may need.

Thank you very much for considering this request. Your expertise and time are highly valued, and I look forward to the possibility of conducting this interview with you.

Yours sincerely in the Dhamma,

(Dr. Nadnapang Phophichit)

Director of Master of Arts in Peace Studies Program,
International Buddhist Studies College
Head of Research Project

No. 005/2024

MAHACHULALONGKORNRAJAVIDYALAYA UNIVERSITY
79 Group 1 Lamsai, Wang Noi,
Ayutthaya 13170, Thailand
Tel. (6635) 248-000-5
Fax (6635) 248-034
URL: www.mcu.ac.th

9 May 2024

Dr. Norbert NÉMETH
Assistant Professor
Dharma Gate Buddhist College
Börzsöny street 11.
Budapest, Hungary 1098

Dear Dr. Norbert NÉMETH
Subject: Kind request for research data collection
Enclosed: Interview form 1 copy

We hope this letter finds you well. I am Dr. Nadnapang Phophichit, Director of Master of Arts in Peace Studies Program (International Program) at International Buddhist Studies College, MCU. As the project head, along with my team, I am currently conducting research titled "***Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure, Pulse rate, and Brain Waves of Practitioners.***"

We are eager to include your valuable insights in this research. I would like to schedule a face-to-face interview with you to collect data from your perspectives for research mentioned above on May 24th (Friday), 2024 at 13:00-14:30 CEST at Dharma Gate Buddhist College. Enclosed with this letter are the interview details and the interview form. Your participation would be greatly appreciated, and we are hopeful that you can accommodate this request in your schedule.

Should you have any questions or require further information about the research, please do not hesitate to contact me via email at nadnapang@ibsc.mcu.ac.th or by Mobile at (+66) 655 199 556. I would be more than delighted to provide any additional details you may need.

Thank you very much for considering this request. Your expertise and time are highly valued, and I look forward to the possibility of conducting this interview with you.

Yours sincerely in the Dhamma,

(Dr. Nadnapang Phophichit)

Director of Master of Arts in Peace Studies Program,
International Buddhist Studies College
Head of Research Project

No. 006/2024

MAHACHULALONGKORNRAJAVIDYALAYA UNIVERSITY
79 Group 1 Lamsai, Wang Noi,
Ayutthaya 13170, Thailand
Tel. (6635) 248-000-5
Fax (6635) 248-034
URL: www.mcu.ac.th

9 May 2024

Zoltán CSER
Assistant Professor
Dharma Gate Buddhist College
Börzsöny street 11.
Budapest, Hungary 1098

Dear Zoltán CSER
Subject: Kind request for research data collection
Enclosed: Interview form 1 copy

We hope this letter finds you well. I am Dr. Nadnapang Phophichit, Director of Master of Arts in Peace Studies Program (International Program) at International Buddhist Studies College, MCU. As the project head, along with my team, I am currently conducting research titled "***Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure, Pulse rate, and Brain Waves of Practitioners.***"

We are eager to include your valuable insights in this research. I would like to schedule a face-to-face interview with you to collect data from your perspectives for research mentioned above on May 27th (Monday), 2024 at 14:30-16:00 CEST at Dharma Gate Buddhist College. Enclosed with this letter are the interview details and the interview form. Your participation would be greatly appreciated, and we are hopeful that you can accommodate this request in your schedule.

Should you have any questions or require further information about the research, please do not hesitate to contact me via email at nadnapang@ibsc.mcu.ac.th or by Mobile at (+66) 655 199 556. I would be more than delighted to provide any additional details you may need.

Thank you very much for considering this request. Your expertise and time are highly valued, and I look forward to the possibility of conducting this interview with you.

Yours sincerely in the Dhamma,

(Dr. Nadnapang Phophichit)
Director of Master of Arts in Peace Studies Program,
International Buddhist Studies College
Head of Research Project

No. 007/2024

MAHACHULALONGKORNRAJAVIDYALAYA UNIVERSITY
79 Group 1 Lamsai, Wang Noi,
Ayutthaya 13170, Thailand
Tel. (6635) 248-000-5
Fax (6635) 248-034
URL: www.mcu.ac.th

9 May 2024

Péter GYŐRI
Study Director
Dharma Gate Buddhist College
Börzsöny street 11.
Budapest, Hungary 1098

Dear Péter GYŐRI
Subject: Kind request for research data collection
Enclosed: Interview form 1 copy

We hope this letter finds you well. I am Dr. Nadnapang Phophichit, Director of Master of Arts in Peace Studies Program (International Program) at International Buddhist Studies College, MCU. As the project head, along with my team, I am currently conducting research titled "***Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure, Pulse rate, and Brain Waves of Practitioners.***"

We are eager to include your valuable insights in this research. I would like to schedule a face-to-face interview with you to collect data from your perspectives for research mentioned above on May 28th (Tuesday), 2024 at 10:30-12:00 CEST at Dharma Gate Buddhist College. Enclosed with this letter are the interview details and the interview form. Your participation would be greatly appreciated, and we are hopeful that you can accommodate this request in your schedule.

Should you have any questions or require further information about the research, please do not hesitate to contact me via email at nadnapang@ibsc.mcu.ac.th or by Mobile at (+66) 655 199 556. I would be more than delighted to provide any additional details you may need.

Thank you very much for considering this request. Your expertise and time are highly valued, and I look forward to the possibility of conducting this interview with you.

Yours sincerely in the Dhamma,

(Dr. Nadnapang Phophichit)
Director of Master of Arts in Peace Studies Program,
International Buddhist Studies College
Head of Research Project

No. 008/2024

MAHACHULALONGKORNRAJAVIDYALAYA UNIVERSITY
79 Group 1 Lamsai, Wang Noi,
Ayutthaya 13170, Thailand
Tel. (6635) 248-000-5
Fax (6635) 248-034
URL: www.mcu.ac.th

9 May 2024

Ferenc BODÓ
Lecturer
Dharma Gate Buddhist College
Börzsöny street 11.
Budapest, Hungary 1098

Dear Ferenc BODÓ
Subject: Kind request for research data collection
Enclosed: Interview form 1 copy

We hope this letter finds you well. I am Dr. Nadnapang Phophichit, Director of Master of Arts in Peace Studies Program (International Program) at International Buddhist Studies College, MCU. As the project head, along with my team, I am currently conducting research titled "***Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure, Pulse rate, and Brain Waves of Practitioners.***"

We are eager to include your valuable insights in this research. I would like to schedule a face-to-face interview with you to collect data from your perspectives for research mentioned above on May 29th (Wednesday), 2024 at 10:30-12:00 CEST at Dharma Gate Buddhist College. Enclosed with this letter are the interview details and the interview form. Your participation would be greatly appreciated, and we are hopeful that you can accommodate this request in your schedule.

Should you have any questions or require further information about the research, please do not hesitate to contact me via email at nadnapang@ibsc.mcu.ac.th or by Mobile at (+66) 655 199 556. I would be more than delighted to provide any additional details you may need.

Thank you very much for considering this request. Your expertise and time are highly valued, and I look forward to the possibility of conducting this interview with you.

Yours sincerely in the Dhamma,

(Dr. Nadnapang Phophichit)

Director of Master of Arts in Peace Studies Program,
International Buddhist Studies College
Head of Research Project

No. 009/2024

MAHACHULALONGKORNRAJAVIDYALAYA UNIVERSITY
79 Group 1 Lamsai, Wang Noi,
Ayutthaya 13170, Thailand
Tel. (6635) 248-000-5
Fax (6635) 248-034
URL: www.mcu.ac.th

9 May 2024

Dr. Gábor KARSAI
Rector
Dharma Gate Buddhist College
Börzsöny street 11.
Budapest, Hungary 1098

Dear Dr. Gábor KARSAI
Subject: Kind request for research data collection
Enclosed: Interview form 1 copy

We hope this letter finds you well. I am Dr. Nadnapang Phophichit, Director of Master of Arts in Peace Studies Program (International Program) at International Buddhist Studies College, MCU. As the project head, along with my team, I am currently conducting research titled "***Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure, Pulse rate, and Brain Waves of Practitioners.***"

We are eager to include your valuable insights in this research. I would like to schedule a face-to-face interview with you to collect data from your perspectives for research mentioned above on May 30th (Thursday), 2024 at 12:00-13:30 CEST at Dharma Gate Buddhist College. Enclosed with this letter are the interview details and the interview form. Your participation would be greatly appreciated, and we are hopeful that you can accommodate this request in your schedule.

Should you have any questions or require further information about the research, please do not hesitate to contact me via email at nadnapang@ibsc.mcu.ac.th or by Mobile at (+66) 655 199 556. I would be more than delighted to provide any additional details you may need.

Thank you very much for considering this request. Your expertise and time are highly valued, and I look forward to the possibility of conducting this interview with you.

Yours sincerely in the Dhamma,

(Dr. Nadnapang Phophichit)

Director of Master of Arts in Peace Studies Program,
International Buddhist Studies College
Head of Research Project

Appendix F

Qualitative Data Collection

In-depth Interviews with Key-Informants (n = 12)

Mahidol University
Faculty of Medical Technology

Research Project
"Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners"

In-depth Interviews with Vipassana Meditation Masters

PHRA BRAHMAWATCHARAVIMONMUNI VI., ASSOC. PROF. DR. (PALI IX)
DIRECTOR VIPASSANADHURA INSTITUTE, MAHACULALONGKORNRAJAVIDYALAYA UNIVERSITY

Mahidol University
Faculty of Medical Technology

Research Project
"Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners"

In-depth Interviews with Vipassana Meditation Masters

PHRA AJAHN SOMPARN SOMPHARO
VIPASSANA MEDITATION MASTER , WAT MAHATHAT YUWARATRANGSARIT, BANGKOK, THAILAND

In-depth Interviews with Vipassana Meditation Masters

PHRA AJAHN AMNAJ KHANTIKO, VIPASSANA MEDITATION MASTER,
VICE ABBOT OF WAT BHANDDANTA ASABHARAM

Mahidol University
Faculty of Medical Technology

Research Project
"Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners"

In-depth Interviews with Vipassana Meditation Masters

PROF. DR. PHRA MEDHIVAJARAPUNDIT,
DIRECTOR OF INTERNATIONAL BUDDHIST STUDIES COLLEGE, MAHACULALONGKORNRAJAVIDYALAYA UNIVERSITY

Mahidol University
Faculty of Medical Technology

Research Project
"Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners"

In-depth Interviews with Vipassana Meditation Masters

PHRAKRU BHAVANASARAPUNDIT, DR.
VIPASSANA MEDITATION MASTER , MAHACULALONGKORNRAJAVIDYALAYA UNIVERSITY

Mahidol University
Faculty of Medical Technology

Research Project
"Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners"

In-depth Interviews with Vipassana Meditation Masters

PHRAMAHA PAIROD NYANAKUSAL (PALI IX),
DIRECTOR OF ABHIDHAMMAJOTIKA COLLEGE, MAHACULALONGKORNRAJAVIDYALAYA UNIVERSITY

Mahidol University
Faculty of Medical Technology

Research Project
"Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners"

In-depth Interviews with Buddhist Scholars

DR. GÁBOR KARSAI, RECTOR,
DHARMA GATE BUDDHIST COLLEGE, BUDAPEST, HUNGARY

PÉTER GYŐRI, STUDY DIRECTOR,
DHARMA GATE BUDDHIST COLLEGE, BUDAPEST, HUNGARY

Mahidol University
Faculty of Medical Technology

Research Project
"Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners"

In-depth Interviews with Buddhist Scholars

ASST. PROF. ZOLTÁN CSER, LECTURER
DHARMA GATE BUDDHIST COLLEGE, BUDAPEST, HUNGARY

ASST. PROF. DR. NORBERT NÉMETH, LECTURER
DHARMA GATE BUDDHIST COLLEGE, BUDAPEST, HUNGARY


IBSC
Mahidol University
Faculty of Medical Technology
Research Project
"Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners"
In-depth Interviews with Buddhist Scholars
MELINDA FÖLDINÉ IRTL, LECTURER,
DHARMA GATE BUDDHIST COLLEGE, BUDAPEST, HUNGARY
FERENC BODÓ, LECTURER,
DHARMA GATE BUDDHIST COLLEGE, BUDAPEST, HUNGARY

Appendix G
Posters for the Research Projects


IBSC
WISDOM FOR THE WORLD
Mahidol University
Faculty of Medical Technology
You are invited to be a part of the research project
To Foster Mindfulness and Concentration
to Deliver Wisdom and Morality to Enhance Peaceful Societies
Research Project Titled:
"Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners"
Date:
8th - 15th July 2024 (7 days)
Location: Wat Bhaddanta Asabharam,
Nong Phai Kaeo , Ban Bueng Chonburi, Thailand
Inclusion Criteria
Age of 20 years or older.
Voluntary participation in the project and signing a consent form after a thorough understanding of the experiment.
Thai nationality
Can participate in the entire retreat, scheduled from 8-15 July 2024 at Wat Bhaddanta Asabharam, Nong Phai Kaeo, Ban Bueng, Chonburi Province, Thailand.
Having experience in practicing mindfulness according to the Four Foundations of Mindfulness at least once.
Ability to practice Walking and Sitting Meditation according to the Four Foundations of Mindfulness for a minimum of 30 minutes per session.
No chronic illnesses; good health.
No mental health issues.
No significant loss of a family member or changes affecting physical and mental health in the past 6 months.
What participants will receive:
Free physical and mental health check-ups, consisting of 5 tests, conducted twice before and after engaging in the research project, valued at 1,800 THB per person, provided by the Holistic Health and Wellness Centre, Faculty of Medical Technology, Mahidol University
Saliva Cortisol Test
Body Composition Analysis
Blood Pressure and Heart Rate Measurement
Brainwave Measurement: Electroencephalogram; EEG
Suanprung Stress Test; SPST
Certificate of Participation in the Research Project
Souvenirs from the Research Project
Contribution to the Meditation and Mindfulness Cultivation Research Project for Delivering Wisdom and Virtue, Enhancing Peaceful Society
This research project is funded by the research grant from the International Buddhist Studies College (IBSC), Mahachulalongkornrajavidyalaya University (MCU) for fiscal year 2024, conducted by the research team of lecturers from IBSC, MCU and the Faculty of Medical Technology, Mahidol University (MUMT).
LINE
Contact for more information
Register to participate
www.ibsc.mcu.ac.th
We are now accepting applications starting from today.
Limited to only 30 participants!
This project has been certified by the Research Ethics Committee at the Buddhist Research Institute, Mahachulalongkornrajavidyalaya University, approval code R.263/2024, approved on May 9, 2024.

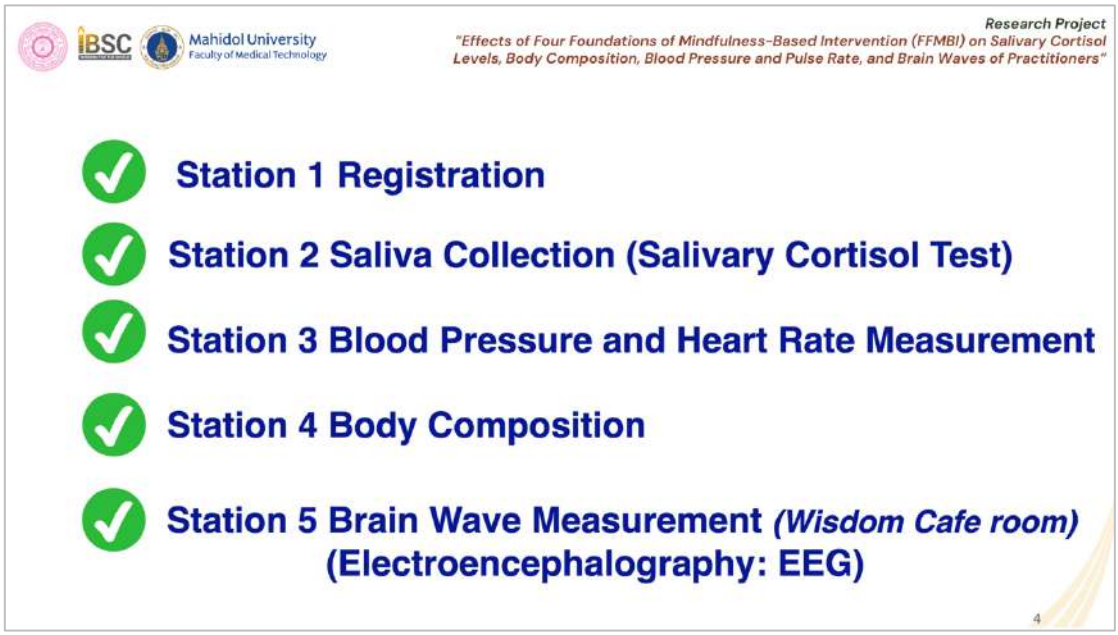

IBSC
WISDOM FOR THE WORLD
Mahidol University
Faculty of Medical Technology
Schedule for Participating in the Research Project
Date
Activities
7 July 2024
From 8:30 AM onwards, participants will engage in an Orientation activity and undergo a Pre-Meditation Health Checkup comprising 5 tests (valued at 1,800 THB per person) conducted by the MUMT Holistic Health and Wellness Centre, Faculty of Medical Technology, Mahidol University. The event will take place at the Samma Panya Room, 4th Floor, Phra Prombundit Building, International Buddhist Studies College (IBSC), Mahachulalongkornraja-vidyalaya University, Lam Sai Subdistrict, Wang Noi District, Phra Nakhon Si Ayutthaya Province, Thailand
Saliva Cortisol Test
Body Composition Analysis
Blood Pressure and Heart Rate Measurement
Brainwave Measurement: Electroencephalogram; EEG
Suanprung Stress Test; SPST
8 July 2024
Opening Ceremony of the Meditation Retreat for the Research Project at Wat Bhaddanta Asabharam
8-15 July 2024
Participate the Meditation Retreat for the Research Project at Wat Bhaddanta Asabharam
15 July 2024
Closing Ceremony of the Meditation Retreat for the Research Project and Post-Meditation Health Checkup Comprising 5 Tests (valued at 1,800 THB per person) conducted by the MUMT Holistic Health and Wellness Centre, Faculty of Medical Technology, Mahidol University at Wat Bhaddanta Asabharam
LINE
Contact for More Information
Scan QR Code to Confirm Participation in the Research Project

Daily Schedule of the FFMBI Program


IBSC
WISDOM FOR THE WORLD
Mahidol University
Faculty of Medical Technology
Announcement of Eligible Participants for the Research Project
To Foster Mindfulness and Concentration to
Deliver Wisdom and Morality to Enhance Peaceful Societies
Research Project Titled:
"Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI)
on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate,
and Brain Waves of Practitioners"
Date: 8-15 July 2024 (7 days)
Location: Wat Bhaddanta Asabharam, Nong Phai Kaeo,
Ban Bueng Chonburi, Thailand
No. Name
1. คุณสมชาย อิทธิยากร
2. Bhikkhuni Nguyen Thi Lanh
3. แม่ชีดาริณี สุนทรโภคิน
4. แม่ชีกรรณิการ์ สุวรรณอาภา
5. แม่ชีสุมล ขำสว่าง
6. แม่ชีดวงมณี ศิริลักษณ์
7. คุณภัทรกาญจน์ ช้อยขด
8. คุณธัญลักษณ์ เขียวสัมฤทธิ์
9. คุณอัจฉราภรณ์ มโนชัย
10. คุณฉัตรสุดา ระจิตดำรงค์
11. คุณอรณิฌา แก้วโพธิ์
12. คุณนิฏฐ์ทันตา ประกฤติพงศ์
13. คุณมนัสนันท์ ชอบประดิษฐ์
14. คุณภรภัทร แผนพุทธา
15. คุณจินตนา แจ้งสว่าง
No. Name
16. คุณทัตขวัญ ท่าคล่อง
17. คุณสุภาภรณ์ อภิชัยเสถียรโชติ
18. คุณภัทรนิษฐ์ อภิบุญมา
19. คุณนงนุช คูเจริญไพศาล
20. คุณสุภาพร กุลวงศ์
21. คุณสุนทรี เสนคำดี
22. คุณสุวภัทร ลิ้มเฮงยิ้ม
23. คุณนภัทร เทพสา
24. คุณรุจิรา สายสมร
25. คุณวัฒนา อัตโสภณ
26. คุณญาณัญญ์ อัตโสภณ
27. คุณจีระพร พรหมโลก
28. คุณวิมลรัตน์ อรรถการต์รัตน์
29. คุณวันทนีย์ เจนบรรจง
30. คุณกิรณา หาญทรงคมณัท
โดย ทีมนักวิจัย คณาจารย์ วิทยาลัยพุทธศาสตร์นานาชาติ (IBSC)
มหาวิทยาลัยมหาจุฬาลงกรณราชวิทยาลัย
และคณะเทคนิคการแพทย์ มหาวิทยาลัยมหิดล (MUMT)
www.ibsc.mcu.ac.th

Appendix H
Experimental Study Pictures

30 participants received **<u>pre-mental and physical health check-ups</u>**, consisting of 5 tests: Saliva Cortisol Test, Body Composition Analysis, Blood Pressure and Heart Rate Measurement, Brainwave Measurement; EEG and Suanprung Stress Test; SPST, conducted before a 7-day Meditation Retreat in the research project, valued at 1,800 THB per person, provided by IBSC, MCU & MUMT on 7th July 2024.


IBSC
Mahidol University
Faculty of Medical Technology
Research Project
"Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners"
Station 1 Registration
Station 2 Saliva Collection (Salivary Cortisol Test)
Station 3 Blood Pressure and Heart Rate Measurement
Station 4 Body Composition
Station 5 Brain Wave Measurement (Wisdom Cafe room)
(Electroencephalography: EEG)
4


REGISTRATION


THANK YOU
ORIENTATION
Brain Wave Measurement


ORIENTATION

Mahidol University
Faculty of Medical Technology

Research Project
"Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners"

Consent Form

Informed Consent Form for Research Participants

Date...../...../.....

I,.....age....., residing at.....Sub-district.....District.....
Province.....Postal Code.....Phone Number.....

Hereby express my willingness to participate in the research project "Effects of Four Foundations of Mindfulness- Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners"

I have been fully informed of the details of the research project, its benefits, and the potential risks involved. I understand everything clearly and agree to participate in the project mentioned above. I am aware that I can inquire about any questions or concerns from the researcher at any time and can withdraw from the research project without any consequences. Furthermore, the researcher will keep my personal data confidential and disclose it only in a summarized form for research outcomes. The disclosure of personal information to related agencies will be done only when necessary for academic reasons.

Therefore, I give my consent to Dr. Nadnapang Phophichit, Director of the Master of Arts in Peace Studies Program (International Program) and a lecturer at the International Buddhist Studies College (IBSC), Mahachulalongkornrajavidyalaya University (MCU), to collect data for the research project titled "Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners".

Participant's Signature .....
Date...../...../.....

Researcher's Explanation

I have clearly explained all aspects of the research project to the participant, including its purpose, benefits, and any potential risks.

Researcher's Signature .....
(Dr. Nadnapang Phophichit)
Date...../...../.....

Stress Test (SPST-20)

By Department of Mental Health, Ministry of Public Health

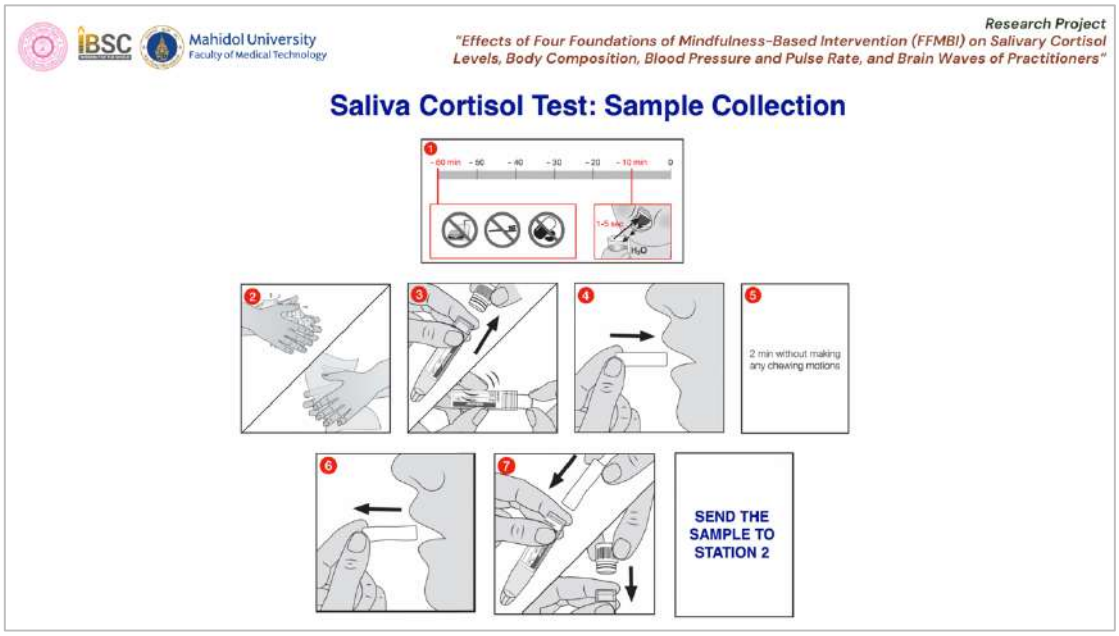
Stress Assessment Form (SPST-20)
Department of Mental Health

Instructions: In the past 6 months, which of the following events have occurred in your life, and how did you feel about them? Please mark / in the stress level column. If an event didn't occur, skip it.

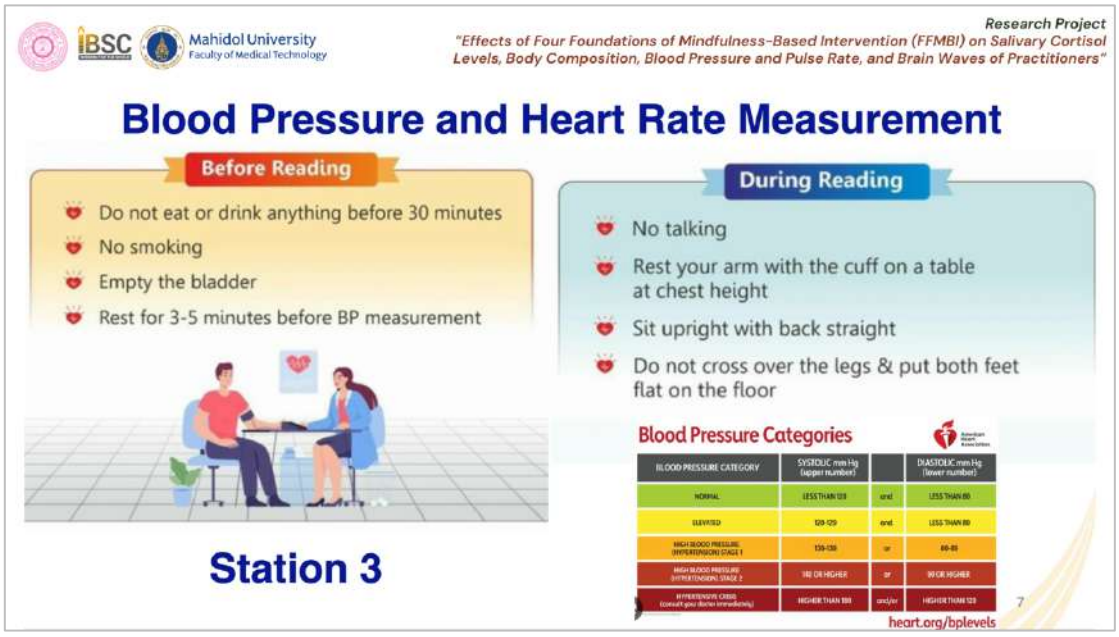
Questions for the past 6 months	Stress Level				
	Not Stress 1	Slightly 2	Moderate 3	High 4	Highest 5
1. Fear of making mistakes at work					
2. Not reaching set goals					
3. Family conflicts about money or housework					
4. Worry about toxins or pollution in air, water, noise, and soil					
5. Feeling the need to compete or compare oneself					
6. Not having enough money					
7. Muscle tension or pain					
8. Tension headaches					
9. Back pain					
10. Changes in appetite					
11. Migraine					
12. Feeling anxious					
13. Feeling frustrated					
14. Feeling angry or irritable					
15. Feeling sad					
16. Poor memory					
17. Feeling confused					
18. Difficulty concentrating					
19. Feeling tired easily					
20. Frequent colds					

Score Interpretation:

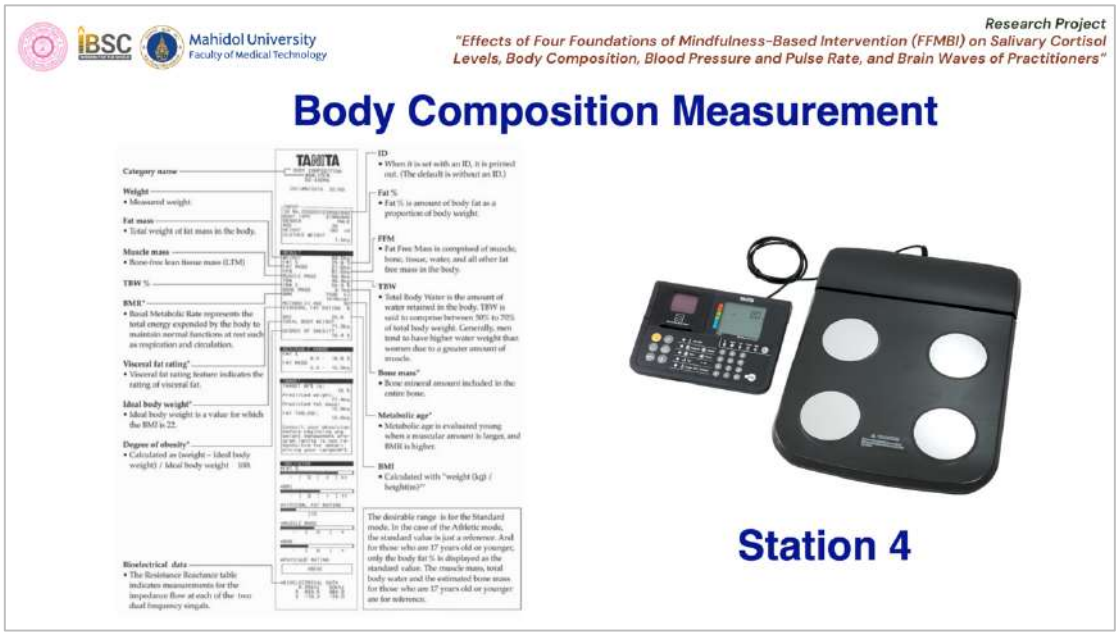
0 - 23 points:	You have low stress that usually passes quickly.
24 - 41 points:	You have moderate stress (normal range). You can relax by doing activities like exercising, listening to music, reading, etc.
42 - 61 points:	You have high stress. You can relieve stress by practicing breathing exercises, talking to someone you trust to find causes or solutions.
62 points or higher:	You have severe stress. You should seek help from a counselor or specialist quickly.


Mahidol University
Faculty of Medical Technology
Research Project
"Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners"
Saliva Cortisol Test: Sample Collection
2 min without making any chewing motions
SEND THE SAMPLE TO STATION 2

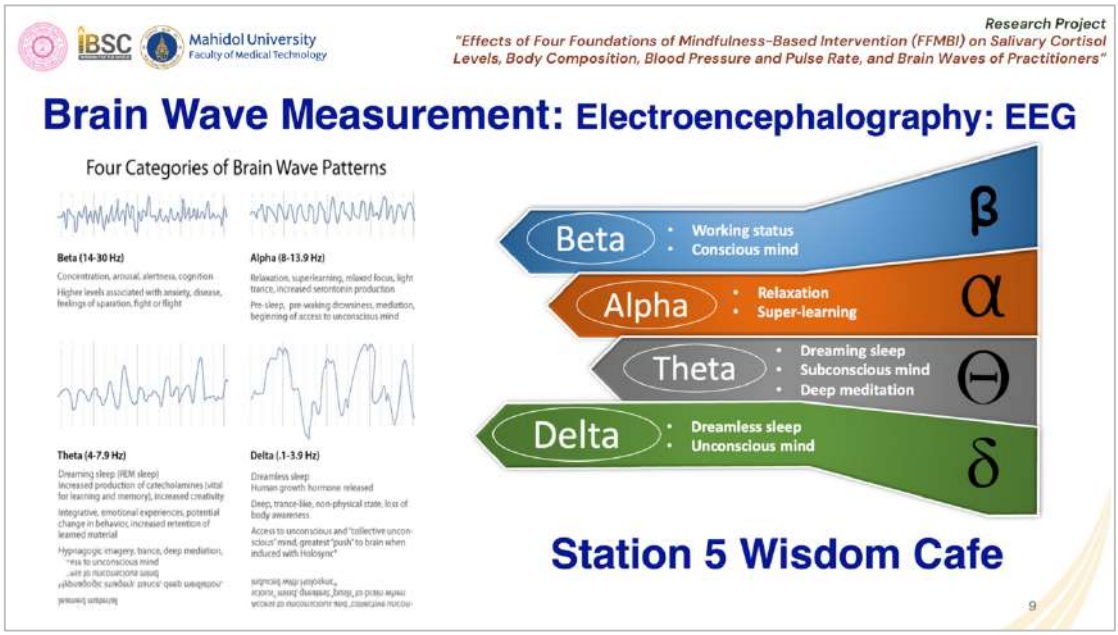

Saliva Cortisol Test: Sample Collection
SALIVARY CORTISOL TEST
2. วัดระดับคอร์ติซอลในน้ำลาย
Saliva Cortisol Test

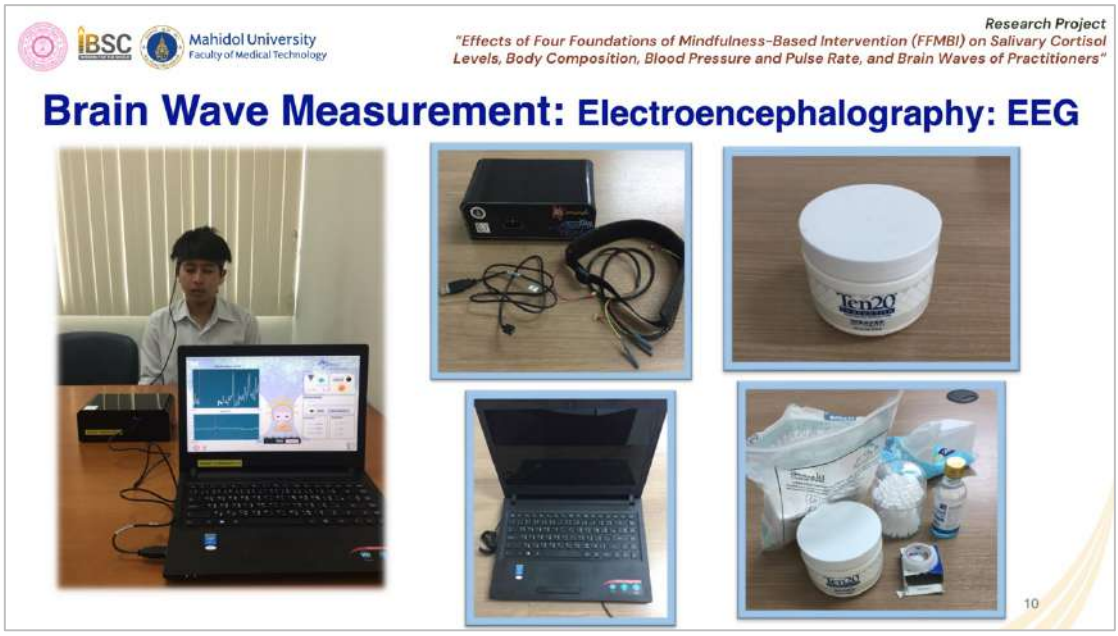

Mahidol University
Faculty of Medical Technology
Research Project
"Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners"
Blood Pressure and Heart Rate Measurement
Before Reading
Do not eat or drink anything before 30 minutes
No smoking
Empty the bladder
Rest for 3-5 minutes before BP measurement
During Reading
No talking
Rest your arm with the cuff on a table at chest height
Sit upright with back straight
Do not cross over the legs & put both feet flat on the floor
Blood Pressure Categories
BLOOD PRESSURE CATEGORY
SYSTOLIC mm Hg (upper number)
DIASTOLIC mm Hg (lower number)
NORMAL
LESS THAN 120
and
LESS THAN 80
ELEVATED
120-129
and
LESS THAN 80
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 1
130-139
or
80-89
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 2
140 OR HIGHER
or
90 OR HIGHER
HYPERTENSIVE CRISIS (consult your doctor immediately)
HIGHER THAN 180
and/or
HIGHER THAN 120
heart.org/bplevels
Station 3


IBSC
CHANNEL
BLOOD PRESSURE
AND PULSE RATE

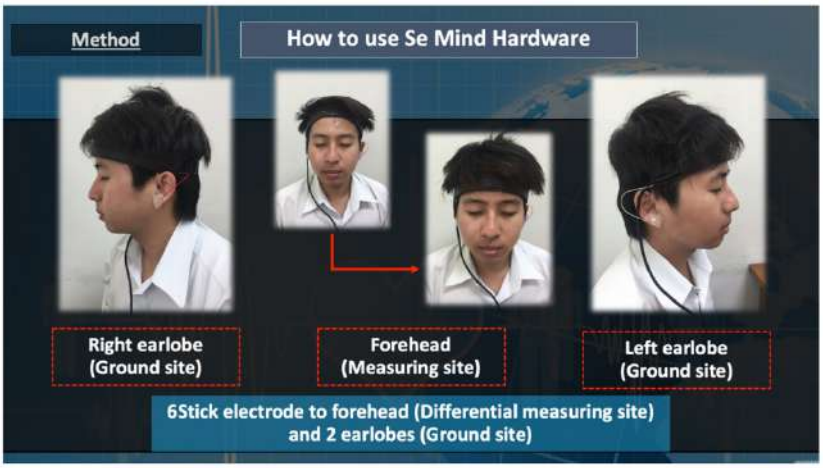

iBSC
Mahidol University
Faculty of Medical Technology
Research Project
"Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners"
Body Composition Measurement
Station 4


iBSC
CHANNEL
BODY
COMPOSITION

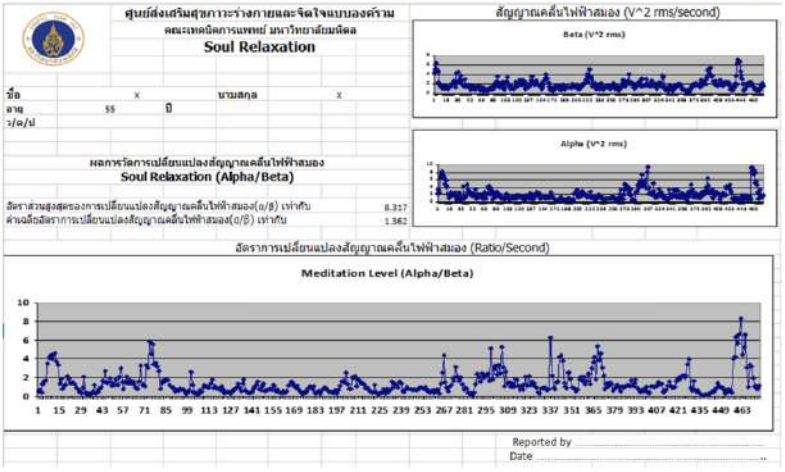

iBSC
Mahidol University
Faculty of Medical Technology
Research Project
"Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners"
Brain Wave Measurement: Electroencephalography: EEG
Four Categories of Brain Wave Patterns
Beta (14-30 Hz)
Concentration, arousal, alertness, cognition
Higher levels associated with anxiety, disease, feelings of separation, fight or flight
Alpha (8-13.9 Hz)
Relaxation, superlearning, relaxed focus, light trance, increased serontonin production
Pre-sleep, pre-waking drowsiness, mediation, beginning of access to unconscious mind
Theta (4-7.9 Hz)
Dreaming sleep (REM sleep)
Increased production of catecholamines (vital for learning and memory), increased creativity
Integrative, emotional experiences, potential change in behavior, increased retention of learned material
Hypnagogic imagery, trance, deep mediation,
Delta (.1-3.9 Hz)
Dreamless sleep
Human growth hormone released
Deep, trance-like, non-physical state, loss of body awareness
Access to unconscious and "collective unconscious" mind, greatest "push" to brain when induced with Holosync"
Beta : Working status · Conscious mind
Alpha : Relaxation · Super-learning
Theta : Dreaming sleep · Subconscious mind · Deep meditation
Delta : Dreamless sleep · Unconscious mind
β
α
Θ
δ
Station 5 Wisdom Cafe
9


iBSC
Mahidol University
Faculty of Medical Technology
Research Project
"Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners"
Brain Wave Measurement: Electroencephalography: EEG
10

Brain Wave Measurement: Electroencephalography: EEG



Brain Wave Measurement: Electroencephalography: EEG




BRAIN WAVE


BRAIN WAVE

30 participants joined the 7-day Meditation Retreat between 8th -15th July 2024 at Wat Bhaddanta Asabharam, Nong Phai Kaeo Subdistrict, Ban Bueng District, Chonburi Province under a guidance of *Vipassanā* meditation masters


DURING FFMBI
7-DAY MEDITATION
PRACTICE


DURING FFMBI
7-DAY MEDITATION
PRACTICE


DURING FFMBI
7-DAY MEDITATION
PRACTICE


DURING FFMBI
7-DAY MEDITATION
PRACTICE


DURING FFMBI
7-DAY MEDITATION
PRACTICE


DURING FFMBI
7-DAY MEDITATION
PRACTICE

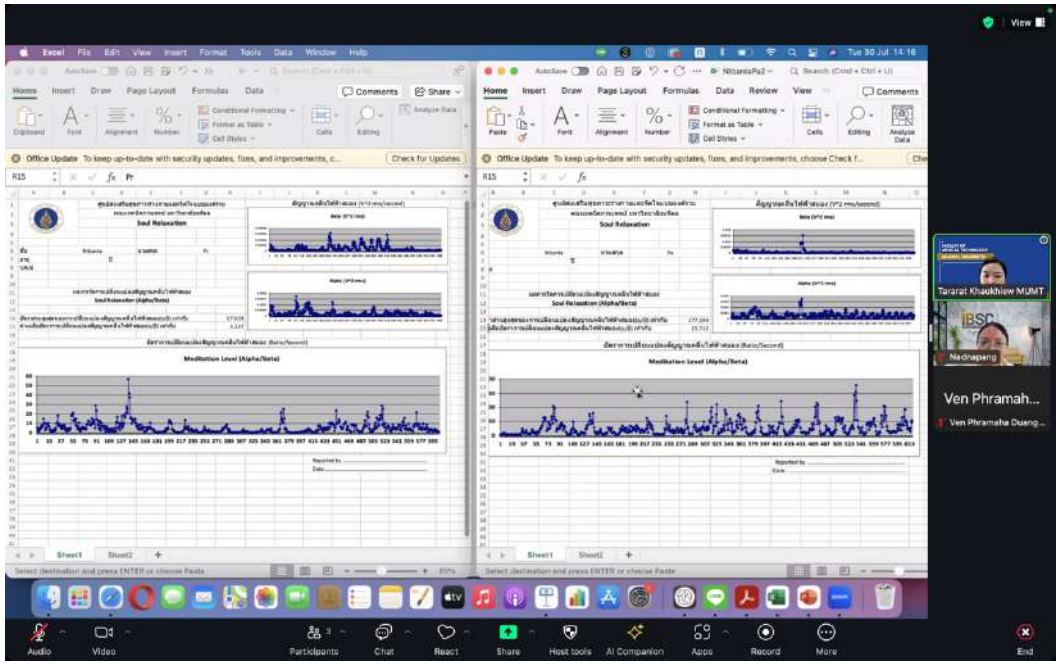
30 participants received **post-mental and physical health check-ups**, consisting of 5 tests: Saliva Cortisol Test, Body Composition Analysis, Blood Pressure and Heart Rate Measurement, Brainwave Measurement; EEG and Suanprung Stress Test; SPST, conducted after a 7-day Meditation Retreat in the research project, valued at 1,800 THB per person, provided by IBSC, MCU & MUMT on 15th July 2024.


POST-MEDITATION
MEDICAL HEALTH
CHECKUPS

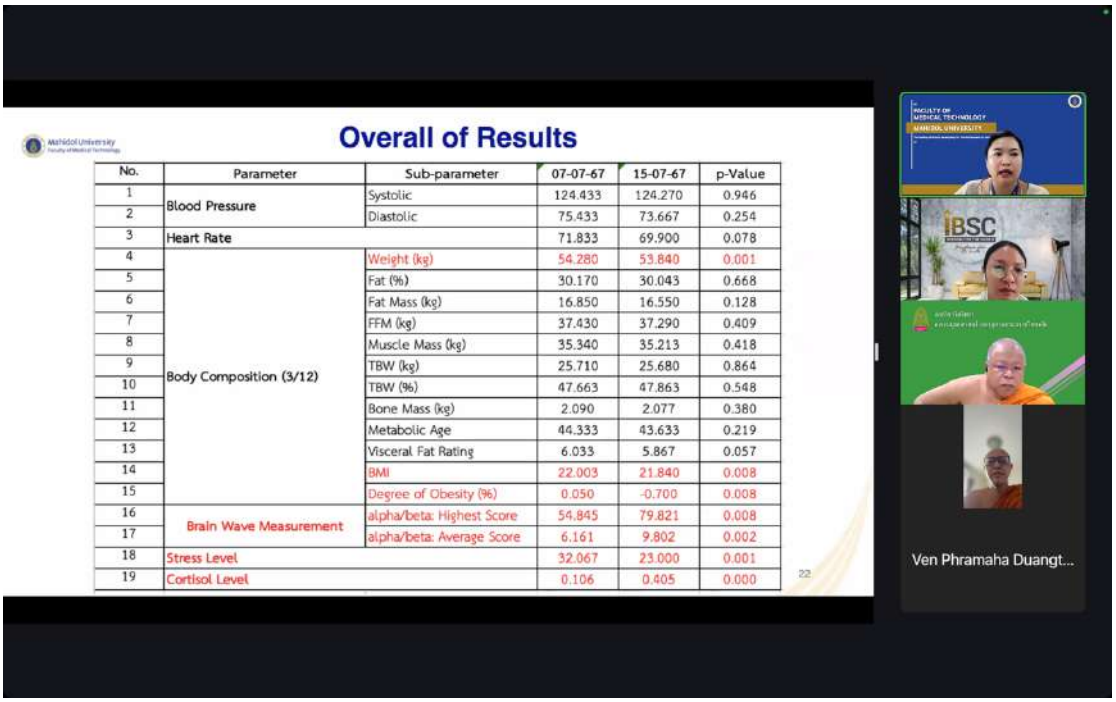

6.
Stress Test
POST-MEDITATION
MEDICAL HEALTH
CHECKUPS

Appendix I

Meeting for Results Analysis and Interpretation



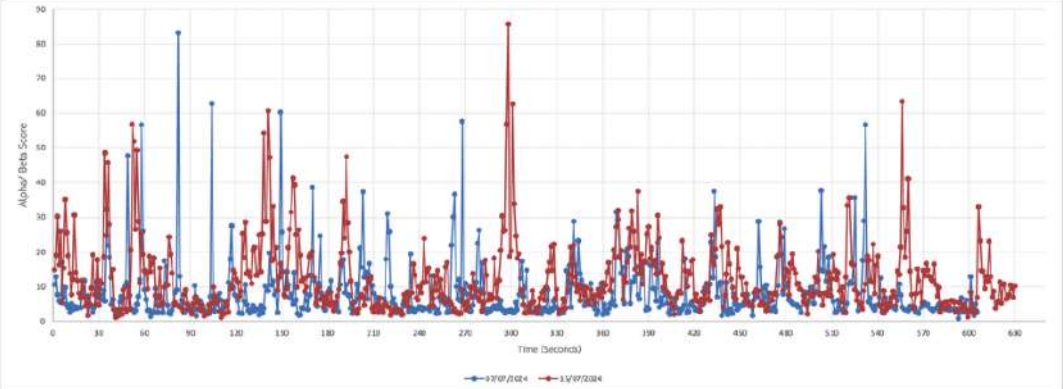
Online Meeting for Results Analysis and Interpretation between researchers from International Buddhist Studies College (IBSC), Mahachulalongkornrajavidyalaya University (MCU) and and the Faculty of Medical Technology, Mahidol University (MUMT).



No.	Parameter	Sub-parameter	07-07-67	15-07-67	p-Value
1	Blood Pressure	Systolic	124.433	124.270	0.946
2		Diastolic	75.433	73.667	0.254
3	Heart Rate		71.833	69.900	0.078
4	Body Composition (3/12)	Weight (kg)	54.280	53.840	0.001
5		Fat (%)	30.170	30.043	0.668
6		Fat Mass (kg)	16.850	16.550	0.128
7		FFM (kg)	37.430	37.290	0.409
8		Muscle Mass (kg)	35.340	35.213	0.418
9		TBW (kg)	25.710	25.680	0.864
10		TBW (%)	47.663	47.863	0.548
11		Bone Mass (kg)	2.090	2.077	0.380
12		Metabolic Age	44.333	43.633	0.219
13		Visceral Fat Rating	6.033	5.867	0.057
14		BMI	22.003	21.840	0.008
15		Degree of Obesity (%)	0.050	-0.700	0.008
16	Brain Wave Measurement	alpha/beta: Highest Score	54.845	79.821	0.008
17		alpha/beta: Average Score	6.161	9.802	0.002
18	Stress Level		32.067	23.000	0.001
19	Cortisol Level		0.106	0.405	0.000

Online Meeting for Results Analysis and Interpretation between researchers from International Buddhist Studies College (IBSC), Mahachulalongkornrajavidyalaya University (MCU) and the Faculty of Medical Technology, Mahidol University (MUMT).

BrainWave Measurement:
Alpha/ Beta Score vs Time (Seconds)



Analysis Results of Brain Wave "the Alpha/ Beta Ratio Score"
by Brain wave measurements taken pre– and post–activity, 10 minutes/ session

The Alpha/ Beta Ratio Score	Pre 7/7/2024	Post 15/7/2024
The ***Highest*** Alpha/ Beta Ratio Score	83.197	85.695
The ***Average*** Alpha/ Beta Ratio Score	8.158	12.22

Interpretation ***(Focus primarily on the average Alpha/Beta ratio scores)***

The Alpha/Beta ratio score refers to calculating a score by dividing the electrical potential of Alpha by Beta brain waves

The blue graph/ blue numbers represent the Alpha/Beta ratio score pre–activity (on 7/7/2024)

The red graph/ red numbers represent the Alpha/Beta ratio score post–activity (on 15/7/2024)

If A high score means calmness and relaxation

A low score means less relaxation, or being focused on a particular matter, or using a lot of mental effort

The difference in the 'positive direction' or a 'green arrow pointing up' means increased relaxation post the activity

The difference in the 'negative direction' or a 'red arrow pointing down' means decreased relaxation post the activity

Online Meeting for Results Analysis and Interpretation between researchers from International Buddhist Studies College (IBSC), Mahachulalongkornrajavidyalaya University (MCU) and the Faculty of Medical Technology, Mahidol University (MUMT).

Appendix J

QR Code to Participants' Video Reflections on the 7-Day FFMBI Program

QR code linking to a video titled “Mindfulness in Practice: Reflections of Participants on the 7-Day FFMBI Program.” The video features participant feedback and personal experiences following their engagement in the Four Foundations of Mindfulness-Based Intervention (FFMBI).

Appendix K

Academic Impact of the Four Foundations of Mindfulness-Based Intervention (FFMBI) Research Project

IBSC Mahidol University Faculty of Medical Technology

Research Project
"Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners"

Research Presentation at the International Conference 2024

The research study was presented at the PsyCon Budapest - International Conference on Psychology & Psychiatry, held on 25-26 September 2024 at Óbuda University, Budapest, Hungary This conference, organized by the Healthcare and Biological Sciences Research Association (HBSRA), provided an international platform to share insights from the research with a global audience.

IBSC Mahidol University Faculty of Medical Technology

Research Project
"Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners"

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Mahidol University
Faculty of Medical Technology

Research Project
"Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners"

Research Contribution at the Dharma Gate Buddhist College (DGBC), Budapest, Hungary

Dr. Nadnapang Phophichit, Head of the Research Project, was invited to deliver a lecture and present the research findings to master's students and faculty members at Dharma Gate Buddhist College (DGBC), Budapest, Hungary, on 23-24 September 2024.

Mahidol University
Faculty of Medical Technology

Research Project
"Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners"

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IBSC Mahidol University Faculty of Medical Technology

Research Project
"Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners"

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IBSC Mahidol University Faculty of Medical Technology

Research Project
"Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners"

Research Contribution at the Rotary Club of Bangkok

Dr. Nadnapang Phophichit, Head of the Research Project, was invited to present the research findings at the Rotary Club of Bangkok on 10 January 2025. This presentation was delivered to an audience of professionals, academics, and community leaders, providing a valuable opportunity to share insights from the research project and promote the application of mindfulness-based interventions within diverse societal contexts.

CERTIFICATE
OF PRESENTATION

Crossref

iSAR

International Conference on Psychology, Cognitive, Education and Behavioral Sciences (ICPCEBS-2024)

17th - 18th September 2024 | Vienna, Austria

This is to certify that Dr. Nadnapang Phophichit affiliated with Mahachulalongkornrajavidyalaya University has presented a paper titled Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure, Pulse Rate, and Brain Waves of Practitioners at the International Conference organized by the International Society for Applied Research (ISAR) held on 17th - 18th September 2024 at Vienna, Austria.

ResearchPEDIA.org

Dr. Ellowen Wakefield
Secretary, ISAR

ISAR

Geeta Priya
Program Manager, ISAR

DRJI

The Certificate of Presentation for Oral Contribution was awarded to Dr. Nadnapang Phophichit in recognition of an oral presentation and research contribution at the International Conference on Psychology, Cognitive, Education and Behavioral Sciences (ICPEBS-2024), held on 17–18 September 2024 in Vienna, Austria. Organized by the International Society for Applied Research (ISAR), the conference provided a global platform for the dissemination of research findings to an international academic audience.

Appendix L
Research Paper Publication in
Scopus-Index Journal (Q2)


IBSC
WISDOM FOR THE WORLD
Congratulations!
Publication of IBSC, MCU
Research Paper
"Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners"
Keywords:
Vipassana Meditation
Mindfulness-based Intervention
Body Composition
Stress Reduction
Brainwave
3 GOOD HEALTH AND WELL-BEING
Scopus Q2
First Author
Dr. Nadnapang Phophichit
Director of the Certificate in Mindfulness Master Program (International Program)
Head of Research Project
Lecturer at International Buddhist Studies College (IBSC), MCU, Thailand
Research Team
1.Dr. Nadnapang Phophichit
2.Phramaha Phuen Kittisobhano, Asst. Prof. Dr.
3.Phramaha Anon Anando, Asst. Prof. Dr.
4.Phramaha Duangthip Pariyattidhari, Dr.
5.Dr. Sakchai Sakabucha
6.Assoc.Prof.Dr. Wilasinee Jeungprasopsuk
7.Dr. Tararat Khaokhiew
Journal:
Spirituality Studies (Scopus Q2)
Visit our website for more
www.ibsc.mcu.ac.th

Appendix M

Certificate of Recognition for Outstanding Contributions in Research, Creative Work, and Academic Achievements

IBSC
WISDOM FOR THE WORLD

CERTIFICATE OF RECOGNITION

This certificate is awarded to

Dr. Nadnapang Phophichit

In recognition of your outstanding contributions in research, creative work, and academic achievements for the year 2025, particularly for your published work in a *Scopus-indexed journal (Q2)*.

Your dedication to advancing the field of Buddhist studies and mindfulness is greatly appreciated.

Given on 13th February 2025

Phra Medhivajarapundit, Prof. Dr.
Director of International Buddhist Studies College

Appendix N

Environmental Setting of the FFMBI Program

(Wat Bhaddanta Asabharam, Chonburi, Thailand)

The FFMBI intervention was conducted at Wat Bhaddanta Asabharam, a dedicated *Vipassanā* meditation monastery located in Chonburi Province, Thailand. This monastic center is open year-round to individuals and groups interested in practicing Satipatthana (foundations of mindfulness) *Vipassanā* meditation. The monastery provides an ideal setting for intensive mindfulness-based retreats, offering an atmosphere of noble silence, natural environment conducive to mindfulness cultivation.

Our research team would like to express our sincere gratitude and deep respect to Phrakhrubhawana Waralangkara Vi. (Phra Ajahn Somsak Sorado), the abbot of Wat Bhaddanta Asabharam and a revered *Vipassanā* meditation master, for his boundless loving-kindness, compassionate support, and generous permission to conduct the FFMBI intervention and data collection at the monastery. His guidance and facilitation were instrumental to the success of this research.

Appendix O

Donation to IBSC in Support of the Buddhist Academic Research Fund

The International Buddhist Studies College (IBSC), MCU, gratefully acknowledges the generous donation of 300,000 THB from Mr. Yutthachai Phukhanthasom to the IBSC Research Fund. This funding was a donation to support the overall advancement of research integrating Buddhist studies with modern science. In line with the College's policy on transparency, research funding is allocated through institutional procedures to qualified faculty members. This particular grant supported the implementation of the research project titled "Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure, Pulse Rate, and Brain Waves of Practitioners." The College and researchers sincerely appreciate the donor's generous support for Buddhist academic research.

Appendix P
QR Code to Full Research Paper Publication in Scopus-Index Journal (Q2)

IBSC Mahidol University Faculty of Medical Technology

Research Project

"Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners"

Research Team

DR. NADNAPANG PHOPHICHIT
HEAD OF THE RESEARCH PROJECT
IBSC, MCU, THAILAND

Phramaha Phuen Kittisobhano, Asst. Prof. Dr.,
Faculty of Humanities, MCU

Phramaha Anon Anando, Asst. Prof. Dr.,
IBSC, MCU

Phramaha Duangthip Pariyattidhari, Dr.
IBSC, MCU

Dr. Sakchai Sakabucha
IBSC, MCU

Assoc.Prof.Dr. Wilasinee J.
Faculty of Medical Technology, MU

Dr. Tararat Khaokhiew
Faculty of Medical Technology, MU

IBSC Mahidol University Faculty of Medical Technology

Research Project

"Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners"

Research Paper Publication

Scan to read full paper

Effects of Four Foundations of Mindfulness-Based Intervention on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners

Phophichit, N., Kittisobhano, P. P., Anando, P. A., Pariyattidhari, P. D., Jeungprasopsuk, W., Khaokhiew, T., & Sakabucha, S. (2025). Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on salivary cortisol levels, body composition, blood pressure and pulse rate, and brain waves of practitioners. *Spirituality Studies*, *11* (1), 19-39.

Biography

1. Head of the Research Project: Dr. Nadnapang Phophichit

(1) Name-Surname Dr. Nadnapang Phophichit

(2) ID Card No. xxxxxxxxxxxxx

(3) Educational Background

Abbhidhamma Studies, Chula Abbhidhamika Tri
Ph.D. in Buddhist Studies (International Program)
M.A. in Buddhist Psychology
B.Sc. in Clinical and Community Psychology
B.A. in Tourism Industry (International Program)

(4) Position Director of Certificate Program in Mindfulness Master (International Program),
International Buddhist Studies College (IBSC),
Mahachulalongkornrajavidyalaya University (MCU)
Lecturer, IBSC, MCU

(5) Address International Buddhist Studies College (IBSC)
Mahachulalongkornrajavidyalaya University (MCU)
79 Moo1, Lamsai, Wang-noi Phra Nakorn Si Ayutthaya
13170, Thailand Tel. 035-248-000

E-mail: Nadnapang@ibsc.mcu.ac.th

(6) Research Experience

(6.1) Research

1. Chatbot Innovation for Enhancing Stress Resilience based on Buddhist Psychology in Working-Aged People, 2024, Research funded by Thailand Science Research and Innovation (Head of Research Project)

2. A Model of *Vipassanā* Meditation Practice for Psychological Well-being Empowerment in Elderly Women, 2024, Research funded by International Buddhist

Studies College, Mahachulalongkornrajavidyalaya University, Thailand. (Co-Researcher)

3. The Model of Mindfulness Practice on Well-Being of Students in International Buddhist Studies College, Mahachulalongkornrajavidyalaya University, 2024, Research funded by International Buddhist Studies College, Mahachulalongkornrajavidyalaya University, Thailand. (Co-Researcher)

4. New Generation Back to Hometown: Creating a Network of Local Innovators for Local Hometown Community Development, 2024, Research funded by Thailand Science Research and Innovation (TSRI). (Co-Researcher)

5. A Model of the 'Khok Nong Na' Buddhist Agriculture Development by Peace Studies Model for Sustainable Development: A Case Study of Sisaket Province, 2022, Research funded by Mahachulalongkorn-rajavidyalaya University, Thailand. (Co-Researcher)

6. Motivation and Practical Guidance for People towards the Royal Cremation Ceremony of the Late King Bhumibol Adulyadej (Rama IX), 2018, A Research funded by BPCPG Public Company Limited. (Co-Researcher)

7. Creating Buddhist Ecological Balance and Maintaining Natural Capital of the Community Forest Networks in the Northeast of Thailand, 2018, A Research funded by Mahachulalongkornrajavidyalaya University, Thailand. (Co-Researcher)

(6.2) Research Findings/Publication/Application of Research

Publication of Academic Articles

Phrakhupalhad Adisak Vajirapañño, Phramaha Hansa Dhammahaso, Sakchai Sakabucha, Nadnaphang Phophichit, "Concept of 'Khok Nong Na Model' for Sustainable Development", Journal of Arts Management, Vol 6, No. 1 (January-March 2022): 419-434.

Publication of Research Articles

1. Nadnapang et al., “Effects of Four Foundations of Mindfulness-Based Intervention (FFMBI) on Salivary Cortisol Levels, Body Composition, Blood Pressure and Pulse Rate, and Brain Waves of Practitioners”, Spirituality Studies, Vol.11, No.1 (Spring, 2025): 19-39.

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2. Co-Researcher: Phramaha Phuen Kittisobhano, Asst. Prof. Dr.

(1) Name-Surname Phramaha Phuen Kittisobhano, Asst. Prof. Dr.

(2) ID Card No. xxxxxxxxxxxxx

(3) Educational Background

Pāli VII, Ph.D. (Psychology)
M.A. (Counseling),
B.A. (Psychology),

(4) Position Asst.Prof., Dr., Assistant Rector for Quality Assurance

(5) Address Faculty of Humanities,
Mahachulalongkornrajavidyalaya University (MCU)
79 Moo1, Lamsai, Wang-noi Phra Nakorn Si
Ayutthaya 13170, Thailand Tel. 035-248-000

E-mail: phuen_kitti@hotmail.com

(6) Research Experience

(6.1) Research

1. The Buddhist Selective Factors Influencing toward The Elderly's Psychological Well-Being, 2015, Research funded by Mahachulalongkorn-rajavidyalaya University, Thailand.

2. The Model of Family Relationship to Intellectual Well – Being of Adolescence, 2016, Research funded by Mahachulalongkorn-rajavidyalaya University, Thailand.

3. An Analysis of Causal Relation Structure of Factors Effected to Moral Courage of Adolescents, 2017, Research funded by Mahachulalongkorn-rajavidyalaya University, Thailand.

(6.2) Research Findings/Publication/Application of Research

Publication of Research Articles

1. Phramaha Phuen Kittisobhano, Phrakrusangrak Ekkapat Abhichandho, Phra Pramote Vadakovito,Kachaporn Kumsonta, The Buddhist Selective Factors Influencing toward The Elderly's Psychological Well-Being, Journal of MCU Peace Studies, Vol. 7 No. 3 (2019): (May - June): 351-364.753-765.

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3. Co-Researcher Phramaha Anon Anando, Asst. Prof. Dr.

(1) Name-Surname Phramaha Anon Anando, Asst. Prof. Dr.

(2) ID Card No. xxxxxxxxxxxxx

(3) Educational Background

Pāli Language Grade V,
Ph.D. in Science of Religion (Hetuvidyā),
M.A. in Religious Studies (Buddhism),
B.A. in Buddhism (Philosophy),

(4) Position Lecturer, Mahachulalongkornrajavidyalaya University

(5) Address International Buddhist Studies College (IBSC)
Mahachulalongkornrajavidyalaya University (MCU)
79 Moo1, Lamsai, Wang-noi Phra Nakorn Si
Ayutthaya 13170, Thailand Tel. 035-248-000

E-mail: anon.pa@mcu.ac.th

4. Co-Researcher Phramaha Duangthip Pariyattidhari, Dr.

(1) Name-Surname Phramaha Duangthip Pariyattidhari, Dr.

(2) ID Card No. xxxxxxxxxxxxx

(3) Educational Background

Pāli Language Grade IX,
Ph.D. in Peace Studies,
M.A. in Social Development,
Dip. in Tipiṭaka

(4) Position Director of Doctoral of Philosophy of Peace Studies Program, International Buddhist Studies College (IBSC), Mahachulalongkornrajavidyalaya University (MCU)

Lecturer, IBSC, MCU

(5) Address International Buddhist Studies College (IBSC)
Mahachulalongkornrajavidyalaya University (MCU)
79 Moo1, Lamsai, Wang-noi Phra Nakorn Si Ayutthaya 13170, Thailand Tel. 035-248-000

E-mail: thipdhara29@gmail.com

5. Co-Researcher Dr. Sakchai Sakabucha

(1) Name-Surname Dr. Sakchai Sakabucha

(2) ID Card No. xxxxxxxxxxxxx

(3) Educational Background

Ph.D. in Peace Studies (International Program),
M.A. in Translation,
M.A. in Laws,
B.A. in Laws

(4) Position Vice-Director of Administrative Affairs,
Lecturer, Mahachulalongkornrajavidyalaya University

(5) Address International Buddhist Studies College (IBSC)
Mahachulalongkornrajavidyalaya University (MCU)
79 Moo1, Lamsai, Wang-noi Phra Nakorn Si
Ayutthaya 13170, Thailand Tel. 035-248-000

E-mail: sakchai9435@gmail.com

6. Co-Researcher Assoc.Prof.Dr. Wilasinee Jeungprasopsuk

(1) Name-Surname Assoc.Prof.Dr. Wilasinee Jeungprasopsuk

(2) ID Card No. xxxxxxxxxxxxx

(3) Educational Background

Doctor of Philosophy (Neurosciences),
Master of Science (Neurosciences),
Bachelor of Science (Conservation Biology)

(4) Position Deputy Dean for Finance and Assets
Lecturer, Faculty of Medical Technology Mahidol University

(5) Address Faculty of Medical Technology, Mahidol University
999 Phutthamonthon 4 Road Salaya, Phutthamonthon
Nakhon Pathom 73170 Thailand
Tel. +66 (0) 2441 4371-5 Ext. 2202

E-mail: wilasinee.suw@mahidol.ac.th

7. Co-Researcher Dr. Tararat Khaokhiew

(1) Name-Surname Dr. Tararat Khaokhiew

(2) ID Card No. xxxxxxxxxxxxx

(3) Educational Background

Ph.D. (Medical Technology),

B.Sc. (Medical Technology),

(4) Position Head of Holistic Health and Medical Diagnostic Center, Lecturer, Department of Clinical Chemistry, Faculty of Medical Technology, Mahidol University

(5) Address Faculty of Medical Technology, Mahidol University

999 Phutthamonthon 4 Road Salaya, Phutthamonthon Nakhon Pathom 73170. Thailand

Tel. +66 (0) 2441 4371-5 Ext. 2202

E-mail: tararat.kha@mahidol.ac.th

8. Student Research Assistant: Bhikkhuni Phan Thi Tho

(1) Name-Surname Bhikkhuni Phan Thi Tho

(2) Student ID 6601106005

(3) Educational Background

Ph.D. Candidate in Buddhist Studies (International Program)
M.A. in English Language (International Program)
B.A. in Buddhist Studies (English Program) (1st class honor)

(4) Position Graduate Student,
International Buddhist Studies College (IBSC)
Mahachulalongkornrajavidyalaya University

(5) Address International Buddhist Studies College (IBSC)
Mahachulalongkornrajavidyalaya University (MCU)
79 Moo1, Lamsai, Wang-noi Phra Nakorn Si Ayutthaya 13170, Thailand Tel. 035-248-000

E-mail: ttho.mcu@gmail.com