

Original Research



The development of a tool to identify skilled meditators among meditation practitioners - 'The University of Colombo Intake Interview to identify Skilled Meditators for scientific research (UoC-IISM)'

NO Outschoorn¹, EASK Somarathne^{1,2}, NN Dasanayaka¹, LJU Karunaratne³, KK Vithanage⁴, KPC Dalpatadu⁴, E Lokupitiya², MW Gunathunga⁵, HMJC Herath⁶, S Jayasinghe⁷, DWN Dissanayake^{1,4*}

¹Research Promotion and Facilitation Centre, Faculty of Medicine, University of Colombo, Sri Lanka; ²Department of Zoology and Environment Sciences, Faculty of Science, University of Colombo, Sri Lanka; ³Department of Physical Medicine, National Hospital of Sri Lanka, Colombo, Sri Lanka; ⁴Department of Physiology, Faculty of Medicine, University of Colombo, Sri Lanka; ⁵Department of Community Medicine, Faculty of Medicine, University of Colombo, Sri Lanka; ⁶Department of Social Science Education, Faculty of Education, University of Colombo, Sri Lanka; ⁷Department of Clinical Medicine, Faculty of Medicine, University of Colombo, Sri Lanka

*Correspondence: dilshanid@physiol.cmb.ac.lk

 <https://orcid.org/0000-0001-6859-2397>

DOI: <https://doi.org/10.4038/jccpsl.v28i4.8542>

Received on 7 Jun 2022

Accepted on 18 Nov 2022

Abstract

Introduction: Buddhist-derived meditation is a well-known phenomenological practice that enhances overall well-being of individuals. However, broad- and less-rigorous criteria in recruiting suitable meditation practitioners affect the reliability of results obtained through meditation research.

Objectives: To develop an instrument to identify skilled meditators among meditation practitioners, in order to use it in scientific research including medical research conducted to understand the physiological, psychological, social, and environmental effects of meditation

Methods: Extensive literature reviews, interviews and focus group discussions with experts in a number of related fields were utilized in developing the instrument. Judgmental validation of the generated items was ensured through establishing their face, content and consensual validity. Internal consistency reliability and factor structure of the scale were explored to analyse its psychometric properties. Cut-off marks were determined to develop a scoring system for the instrument.

Results: Twenty-five items were categorized under five sections (A, B, C1, C2, D) that addressed six factors: duration of the meditation practice, details of the meditation practice, peripheral awareness, stable attention, and alertness and emotional stability. Three further qualitative items were added under section E. An exploratory factor analysis process resulted in a two-factor structure between the Likert-scale items as theoretically expected. Scores to identify 'skilled meditators' were determined as: Section C1 > 7 (fall-back score; 7-9, ideal score; 10-12), Section C2 > 14 (fall-back score; 14-16, ideal score; 17-20) and Section D > 25 (fall-back score; 25-29, ideal score; 30-35).

Conclusions & Recommendations: The overall findings reveal the UoC-IISM to be a valid and reliable tool to be used in identifying skilled meditators, among meditation practitioners, for scientific research in the Sri Lankan context. The instrument explores six factors through its 28 items and the importance of using a combination of these factors is discussed.

Keywords: *Buddhist meditation, skilled-mediator, scientific meditation research, stable attention, peripheral awareness, emotional stability and alertness*

Introduction

Research on Buddhist meditation is popular among multi-disciplinary scientific communities due to its wide array of benefits, including being a form of health promotion that facilitates the interaction between human mind and body (1-2), a powerful organizational tool for enhancing employee health and wellness (3), and enhancing connectedness to nature and pro-environmental behaviour (4). The core concepts of the practice are integral to Buddhist teachings and have been most precisely laid out in Buddhist meditation texts predating the practice back to thousands of years.

In terms of defining meditation, it can be understood as a set of mental practices which ultimately leads to the insights into understanding the nature and workings of one's mind (5-6). Meditation cultivates mindfulness which is the practice of bringing one's attention to the internal and external experiences occurring in the present moment without judgement, and with an attitude of curiosity, acceptance, kindness, compassion and patience (7).

A plethora of research have been conducted to explore how meditation and mindfulness bring about health and non-health benefits. However, a considerable limitation of such studies is the exploration of only a narrow range of variables related to one's meditation practice when recruiting meditators as participants and this in turn may hinder the clear identification of the beneficial nature of meditation (8). A further limitation in Buddhist-derived meditation studies is the inclusion of relatively inexperienced meditators (9). As empirical evidence suggests, often meditators are recruited solely based on the duration of meditation where skill and specific details about the maintenance of their meditation practice are overlooked. Buddhist literature too suggest that the duration of the meditation practice may not be a prominent factor that influences the benefits of meditation. Thus, it highlights the need for considering other factors that may play a role in identifying a 'skilled meditator' when conducting scientific research. However, there are no known scientifically and specifically defined criteria/tools/questionnaires developed to explore the

skills of a meditation practitioner prior to them being recruited for scientific studies.

In identifying a skilled meditator, John Yates & colleagues (10) suggest a conceptual framework of ten stages and four milestones that represents one's progression in the path of meditation (Appendix 1). Further literature has identified the importance of details of the practice (e.g. duration and frequency) and cultural and person related factors of the meditator (8), participation of meditation intense retreats (10-11) in defining a skilled meditator, thus highlighting the importance of considering the interplay of multiple factors. Our study aimed at developing and validating an instrument with more rigorous criteria to screen Buddhist meditators for scientific research. It is expected that this instrument will enable future investigations on meditation in recruiting skilled Buddhist meditators through structured criteria.

Methods

The study was conducted by the Meditation Research Group of the University of Colombo (MRG-UoC), Sri Lanka. It consisted of two groups (group 1; n=14 and group 2; n=30) of consenting meditation practitioners chosen from a number of meditation centres across the country. Connections with these centres were made through meditation trainers/practitioners in the MRG-UoC. Participants were individuals who had been maintaining a consistent practice of meditation for the last three or more years for an average period of four-five hours per week and who followed meditation practices followed at Sri Lankan meditation centres/temples/monasteries led by Buddhist monks/nuns. Participants who had learning or cognitive disabilities and who had obtained psychiatric and psychological help over the past five years were excluded from the study. They were recruited using purposive sampling and were above the age of 18 years. The study was conducted in two phases; 1) development and judgemental validation of the tool in group 1 and, 2) evaluating reliability and construct validity of the tool in group 2.

Development and judgemental validation of the tool

During the initial construction of the proposed tool, potential items were drawn through extensive literature search, in-depth interviews and focus group discussions. Interviews were conducted with an expert group of meditation practitioners, academics and scientists, selected using snowballing based on their expertise in areas of Buddhist meditation, psychology, cognitive sciences, physiology, environmental and social sciences, and questionnaire development.

During item generation, an initial draft (draft 1) consisting of 23 items was developed by wording the items in positive and negative directions. Items were developed in English to retain conceptual clarity of the theoretical aspects conveyed through relevant literature. The draft was then subjected to a focus group discussion with the expert group where rephrasing, reductions and additions of items were done based on their feedback. This ensured the inclusion of functional and consistent items and explored if the items were worded in a clear, comprehensible and unambiguous way in order to respond effortlessly. The resulting draft (draft 2) was then subjected to judgemental validation, which ensured conceptual definitions being appropriately translated and converted into operational terms (12). Expert judgment ensured face, consensual, and content validity (13). In ensuring face validation, draft 2 was subjected to forward-backward translation which enabled semantic translation during cross cultural/linguistic translation of psychometric tools (14-15). This process resulted in two documents; a final Sinhala translation (draft 3S) to be used with the target population and an English back translation (draft 3E) to be used as a reference document alongside draft 3S, if English language support is needed. Draft 3S was then pre-tested with group 1 to evaluate its linguistic clarity. This process resulted in draft 4 (Sinhala) and a modified draft 3E. To ensure content and consensual validity, draft 4 was then subjected to a Delphi process where 11 experts (16), representing fields related to meditation and science, evaluated each item for linguistic, conceptual and cultural appropriateness on a 10-point

Likert scale ranging from 0 (total disagreement) to 9 (total agreement). Draft 3E too was continuously edited to suit its corresponding Sinhala document. The Delphi process resulted in draft 5 which was then again pre-tested with group 1, after which the final draft was developed and administered to group 2. Construct validity, internal consistency reliability, and cut-off scores for relevant scales were determined through data obtained from group 2.

Construct validity and internal consistency reliability of the tool

The construct validity of a number of subscales of the tool was explored by analysing the factor structure while reliability of the resulting factors was explored by investigating their internal consistency reliability (17). In terms of construct validity, an Exploratory Factor Analysis (EFA) with a pre-determined factor structure was conducted (18). The selection of factors was performed using the varimax of the orthogonal rotation with Kaiser Normalization. The pre-determined factor structure represented 13 scale items scored using a Likert scale ranging from 1 (very often or always) – 5 (never or very rarely) that were identified under three themes; stable attention, state of alertness, and emotional stability. All these items were combined and factor structure of this combined item pool was explored.

The Cronbach's alpha was calculated to explore the internal consistency of the factors (19) that were resultant through the EFA process. Cut-off scores were determined through mean values and standard deviation (SD) obtained for Sections C and D during the administration of the questionnaire to group 2. All data were analysed using IBM SPSS, version 23. The development and validation processes described above are summarised in Figure 1.

Results

Development and the judgemental validation of the tool

The initial English draft (draft 1) had 23 items pooled together under four subsections: duration of

the meditation practice (Section A), details of the meditation practice (Section B), heightened peripheral awareness and stable attention (Section C), and state of alertness and emotional control (Section D). Twelve items were pooled under Sections A and B, while 11 items were pooled under Sections C and D. Higher scores obtained for Sections C and D were considered to denote higher skill levels in terms of the considered constructs.

Expert group feedback on draft 1 resulted in Section C being split into two separate subsections; heightened peripheral awareness (Section C1) and stable attention (Section C2). Section C1 items consisted of contingency questions and therefore were allocated a range of responses, including ‘all the time – never’ and ‘very quickly – took some time (more than 5 minutes)’. Section C2 items were rearranged in a five-point Likert scale ranging from 1 (very often or always) – 5 (never or very rarely). Further expert feedback resulted in the reduction of three items in Section D (due to lack of conceptual coherence) and addition of seven items representing the Five Mental Hindrances (FMH) (*Pancha Nivarana dharma*) in Buddhist meditation; sensual desire (*kamachchanda*), ill-will (*vyapada*), sloth and torpor (*thina-middha*), restlessness and remorse (*uddhacca-kukkucca*) and sceptical doubt (*vicikicca*) which were arranged in a five-point Likert scale ranging from 1 (*very often or always*) – 5 (*never or very rarely*). This focus group process resulted in developing 27-item draft 2 where additional phrases such as the phrase “e.g., shifting the object of meditation from breath to pain and etc.” was added to the end of question no. 13 which was initially phrased as “Did you get distracted and forget the object of attention?”. Example phrases were further added to all questions in Section D in order to ensure conceptual coherence. Draft 2 was then subjected to forward-backward translation, thus resulting in drafts 3E (English back translation) and 3S (Sinhala translation). During the pre-test process of draft 3S, changes in the wordings of certain items were done, such as the term “guilt” was replaced with “remorse” to better capture emotional stability/control (Section D) in terms of restlessness and remorse as indicated through the FMH.

The Delphi process which evaluated draft 4 highlighted the importance of improving conceptual clarity. As a result, the question “How many times do you realize that the mind wandered and was able to resume full meditation?” was dismantled into two questions; “Did your mind wander (thinking of something else while meditating)?” and “If your mind wandered, how long does it usually take for you to resume meditation after a period of wandering?” Furthermore, three general questions were added to the existing item pool to explore individual opinions about meditation practices, their benefits and recommendations for a beginner. The resulting draft 5 consisted of 30 pooled items which were categorised under five sub-sections; duration of meditation practice (Section A), details of meditation practice (Section B), heightened peripheral awareness (Section C1) and stable attention (Section C2), emotional stability and alertness (Section D) and general questions (Section E).

Construct validity and internal consistency of the tool

The sample (n=30) of meditation practitioners recruited for assessing construct validity consisted of 17 females (56.7%). The participants were aged 27-60 years (mean=45.07; SD=10.12) and reported to have 3-21 years (mean=7.88; SD=4.93) of meditation experience along with 4-42 (mean=10.03; SD=9.49) meditation hours per week. All participants were employed.

During the EFA process, Kaiser-Meyer-Olkin (KMO) value of 0.56 suggested adequacy of the chosen sample size. The Bartlett’s test for sphericity was significant ($\chi^2=149.93$; $df=78$; $p<.001$), indicating at least one significant correlation between two items in the scale and the suitability to perform EFA (20). In terms of communalities estimates, no items were removed as all values were above 0.3 (21). During the principal component analysis (PCA), eigenvalues greater than 1 (22) were observed in the first five factors, which were 3.688 (28.37%), 1.988 (15.26%), 1.812 (13.94%), 1.319 (10.15%) and 1.075 (8.27%). However, in terms of the scree plot, a sudden unambiguous change was identified to have occurred after the second factor. The number of desired factors too was estimated at

two, based on theoretical underpinnings and selection of items was performed using varimax of the orthogonal rotation. Item no. 19 did not produce loadings on any of the factors. The answer to this item was linked with item no.20, and therefore both were eliminated. Cronbach’s alpha values reported for factor 1 and factor 2 were 0.77 and 0.64, respectively. The items loaded under these two factors were understood to represent the themes, *emotional stability* (factor 1) and *stable attention and alertness* (factor 2) (subsequently named as sections D and C2 respectively), which was different to how items were categorized during the judgmental

validation process, where section C2 represented *stable attention* and Section D represented *alertness and emotional stability*. Based on the mean and SD obtained for sections C and D (Table 2), the scores to identify ‘skilled meditators’ were determined as: Section C1 > 7 (fall-back score; 7-9, ideal score; 10-12), Section C2 > 14 (fall back score; 14-16, ideal score; 17-20) and Section D > 25 (fall-back; 25-29, ideal score; 30-35).

The time taken for completion of the questionnaire was reported as 15-35 minutes.

Table 2: Descriptive statistics of the total scores obtained for Sections C and D

	Meditators (N=30)			
	Mean	SD	Minimum	Maximum
Section C1	8.63	1.217	6	11
Section C2	16.77	2.674	11	20
Section D	28.70	3.697	21	35

Discussion

The current study aimed at developing and validating a tool to identify skilled meditators for scientific research. Six factors namely heightened peripheral awareness, stable attention and alertness, emotional stability, the duration of the meditation practice, and details of the meditation practice were identified in defining a ‘skilled meditator’. Among these, the initial four were derived from the conceptual framework for identifying skilled meditators presented by Yates and colleagues (10) and were in line with further conceptual and empirical evidence that differentiated between novices and meditators with experience.

Stable attention enhances mindfulness (23) while peripheral awareness may indicate the firm establishment of one’s stable attention. According to Buttle (24), alertness can be understood as an attentional aspect of meditation which is encouraged by the Buddhist concept of awakening, and meditation promotes insight by keeping the practitioner alert and mindful (25). Insight and awakening are phenomena that occur in later and

more profound states of meditation which require more practice and skill. Furthermore, alertness plays a key role in strengthening and improving attentional functions (26), which may further contribute to the development of stable attention overtime. This theoretical basis was further supported by our EFA process where items representing stable attention and alertness loaded in to one single factor (factor 2) suggesting their possible inter-correlation. The reliability of this factor in assessing *stable attention and alertness* (Section C2) was ensured.

Higher emotional stability through reduced arousal evoked by sensory stimuli is seen in practitioners with experience (20, 27-29). To capture this concept, we included the concept of the Five Mental Hindrances (FMH) suggested in traditional Buddhist literature. The FMH are viewed as unwholesome negative states of mind that obstruct and hinder the progression made towards the ultimate goal of meditation, *nirvana* (enlightenment) (30), thus utilized as indicators of emotional stability/control and alertness which are established in skilled meditators. As indicated by the EFA process, all items representing the concept of FMH loaded into

one factor (factor 1). The reliability of this factor in assessing *emotional stability* (Section D) was ensured.

In terms of content and context related factors, prolonged time durations are empirically found effective in better detecting changes in brain plasticity, and meditation practitioners with long-term experience and skills may be ideal human models for this identification given the regularity, duration, and the on-going nature of their meditation practice (31). Furthermore, we identify the combination of duration, frequency, and participation in retreats to be important as extensive meditation training can happen in multiple ways and time periods where intense and lengthy meditation can occur during retreats as opposed to daily home practice with less intensity (32). Moreover, identifying content and context of the meditation practice in terms of cultural/place and person-related factors were deemed important as the setting and background where meditation is practiced is often found to be a predictor of certain meditation states (8). The above suggests the benefit of exploring the duration, frequency/regularity, participation in meditation retreats, and person and place related factors in identifying meditator participants in effectively yielding scientific results.

In terms of construct validity of the tool, the two factors identified through EFA were in line with the concepts considered. Cronbach's alpha levels between 0.6-0.8 suggested that all items in these factors reflected the concept intended to be measured. Defining cut-off scores was based on a pilot study which was carried out within the cultural context, and future research on scoring systems should be followed if this tool is to be used beyond the Sri Lankan context. While the six factors of the tool may clearly demarcate between skilled and inexperienced meditators, further empirical and theoretical literature indicates these factors to be intertwined with one another. For example, regularity of meditation is found to improve emotional stability (33), while continuous stable attention especially promoted through participation in intense meditation-retreats, is found to develop and improve alertness which is associated with the ventral attention system

(24). Therefore, we emphasize the importance of using all these aspects as a combination in identifying a skilled meditator. With the addition of the three general questions which qualitatively explored the opinions of meditators on certain meditation-related phenomena, an Intake Interview with 28 questions was developed through this study.

This study has flagged the importance of using such a systematic approach in developing the tool, while minimizing errors commonly found in meditation research at the point of participant recruitment. Limitations include the lower number of study units used in the study.

Conclusions & Recommendations

Through the current study, a psychometric instrument to identify skilled meditators among meditation practitioners for scientific meditation research, was developed. Six factors in defining a skilled meditator, namely heightened peripheral awareness, stable attention, emotional stability, alertness, duration of the meditation practice and details of the meditation practice, were identified through a rigorous methodology consisting of extensive literature search, in-depth interviews, focus groups and Delphi process. The current study developed and validated a 28-item instrument with conceptual, cultural, and linguistic coherence.

Public Health Implications

- The UoC-IISM validated through the current study will be a valid and reliable tool for researchers to identify skilled meditators among meditation practitioners when recruiting them for studies on meditation, thus enabling the understanding of the effects of meditation and its benefits for the wider community. This identification may further pave way to developing and assessing the effectiveness of meditation-based interventions aimed at addressing concerns of clinical and non-clinical populations.

Author Declarations

Competing interests: The authors declare that they have no competing interests.

Ethics approval and consent to participate: This study was conducted under the approval of the Ethics Review Committee of the Faculty of Medicine of the University of Colombo, Colombo, Sri Lanka (Ethics approval number: EC-19-086). Informed consent was obtained from all individual participants included in the study. All methods carried out in this study are in accordance with relevant guidelines and regulations.

Funding: This work was supported by the AHEAD grant of the World Bank (Grant No. 6026-LK/8743-LK). The funding agency had no role in the designing of the study, data acquisition, analysis, and interpretation of data and in writing the manuscript.

Acknowledgements: We thank the lead meditators and members of our research group, the Meditation Research Group of the University of Colombo (Colombo, Sri Lanka), for providing us with knowledge and training on meditation and supporting with approaching meditation centres in the country. We thank all the participants, scholars, scientists and academics who contributed to the study with their invaluable knowledge in meditation and mindfulness.

Author contributions: NOO, EASKS, NND: Methodology, acquisition and analysing of data, investigation, critically revising the manuscript, writing – original draft preparation, review and editing; LJUK, KKV, KPCD: Methodology, investigation, review and editing; EL, MWG, HMJCH, SJ: reviewing and editing, resources, supervision; DWND: Conceptualization, methodology, investigation, writing – review and editing, funding acquisition, resources, supervision.

References

- Horowitz S. Health benefits of meditation: What the newest research shows *Altern Complement Ther* 2010; 16(4): 223-228. DOI: 10.1089/act.2010.16402.
- Kok BE, Waugh CE, Fredrickson BL. Meditation and Health: The Search for Mechanisms of Action. *Soc Personal Psychol Compass* 2013; 7(1): 27-39. DOI: 10.1111/spc3.12006.
- Karimi L, Kent SP, Leggat SG, Rada J, Angleton A. Positive Effects of Workplace Meditation Training and Practice. *Int J Psychol Stud* 2019; 11(1): 15. DOI: 10.5539/ijps.v11n1p15.
- Ray TN, Franz SA, Jarrett NL, Pickett SM. Nature Enhanced Meditation: Effects on Mindfulness, Connectedness to Nature, and Pro-Environmental Behavior. *Environ Behav* 2021; 53(8): 864-890. DOI: 10.1177/00139165209524.
- Aich TK. Buddha philosophy and western psychology. *Indian J Psychiatry* 2013; 55(Suppl 2):S165. DOI: 10.4103/0019-5545.105517.
- Sharma H. Meditation: Process and effects. *AYU (An Int Q J Res Ayurveda)* 2015; 36(3): 233.
- Kabat-Zinn J, *Wherever You Go There You Are: Mindfulness Meditation in Everyday Life*. New York: Hyperion, 1994.
- Thomas JW, Cohen M. A Methodological review of meditation research. *Front Psychiatry* 2014; 5. DOI: 10.3389/fpsy.2014.00074.
- Easterlin BL, Cardeña E. Cognitive and Emotional Differences between Short- and Long-Term Vipassana Meditators. *Imagin Cogn Pers* 1998; 18(1): 69-81. DOI: 10.2190/21GX-R4TD-XMD4-6P2W.
- Yates J, Immergut M, Graves J. *The Mind Illuminated: A Complete Meditation Guide Integrating Buddhist Wisdom and Brain Science for Greater Mindfulness*. Simon and Schuster, 2017.
- Montero-Marin J, Puebla-Guedea M, Herrera-Mercadal P, Cebolla A, Soler J, Demarzo M, et al. Psychological effects of a 1-month meditation retreat on experienced meditators: The role of non-attachment. *Front Psychol* 2016; 7: 1-10. DOI: 10.3389/fpsyg.2016.01935.
- Morabia A. Survey Methods in Community Medicine: Epidemiological Research, Programme Evaluation, Clinical Trials. Fifth Edition - By J. H. Abramson and Z. H. Abramson. *Am J Epidemiol.* 2000; 152(1): 96-96. DOI: 10.1093/aje/152.1.96.
- Kumarapeli V, Seneviratne R de A, Wijeyaratne CN. Validation of WHOQOL-BREF to measure quality of life among women with polycystic ovary syndrome. *J Coll Community Physicians Sri Lanka* 2006; 11(2): 1.
- Bartram D, Berberoglu G, Grégoire J, Hambleton R, Muniz J, van de Vijver F. ITC Guidelines for Translating and Adapting Tests (Second Edition). *Int J Test* 2018;18(2): 101-134.
- Epstein J, Santo RM, Guillemin F. A review of

- guidelines for cross-cultural adaptation of questionnaires could not bring out a consensus. *J Clin Epidemiol* 2015; 68(4): 435-441. DOI: 10.1016/j.jclinepi.2014.11.021.
16. Akins RB, Tolson H, Cole BR. Stability of response characteristics of a Delphi panel: Application of bootstrap data expansion. *BMC Med Res Methodol* 2005; 5. DOI: 10.1186/1471-2288-5-37.
 17. McCrae RR, Kurtz JE, Yamagata S, Terracciano A. Internal consistency, retest reliability, and their implications for personality scale validity. *Personal Soc Psychol Rev* 2011; 15(1): 28-50. DOI: 10.1177/1088868310366253.
 18. Watkins MW. Exploratory Factor Analysis: A Guide to Best Practice. *J Black Psychol* 2018; 44(3): 219-246. DOI: 10.1177/0095798418771807.
 19. Tavakol M, Dennick R. Making sense of Cronbach's alpha. *Int J Med Educ* 2011; 2: 53-55. DOI: 10.5116/ijme.4dfb.8dfd.
 20. Lutz A, Slagter HA, Rawlings NB, Francis AD, Greischar LL, Davidson RJ. Mental training enhances attentional stability: neural and behavioral evidence. *J Neurosci* 2009; 29(42): 13418-13427. DOI: 10.1523/JNEUROSCI.1614-09.200921.
 21. Hosie P, Sevastos P, Cooper CL. The "happy productive worker thesis" and Australian managers. *J Hum Values* 2007; 13(2): 151-176. DOI: 10.1177/097168580701300207.
 22. Mantzios M, Wilson JC. Psychometric Properties of the Greek Versions of the Self-Compassion and Mindful Attention and Awareness Scales. *Mindfulness* 2015; 6(1): 123-132. DOI: 10.1007/s12671-013-0237-3.
 23. Lykins ELB, Baer RA. Psychological functioning in a sample of long-term practitioners of mindfulness meditation. *J Cogn Psychother* 2009; 23(3): 226-241. DOI: 10.1891/0889-8391.23.3.226.
 24. Buttle H. Measuring a journey without goal: Meditation, spirituality, and physiology. *Biomed Res Int* 2015. DOI: 10.1155/2015/891671.
 - 25.. Ren J, Huang ZH, Luo J, Wei GX, Ying XP, Ding ZG, et al. Meditation promotes insightful problem-solving by keeping people in a mindful and alert conscious state. *Sci China Life Sci* 2011; 54(10): 961-965. DOI: 10.1007/s11427-011-4233-3.
 26. Malinowski P, Shalamanova L. Meditation and Cognitive Ageing: The Role of Mindfulness Meditation in Building Cognitive Reserve. *J Cogn Enhanc* 2017; 1(2): 96-106. DOI: 10.1007/s41465-017-0022-7.
 27. Broderick PC. Mindfulness and coping with dysphoric mood: Contrasts with rumination and distraction. *Cognit Ther Res* 2005; 29(5): 501-510. DOI: 10.1007/s10608-005-3888-0.
 28. Arch JJ, Craske MG. Mechanisms of mindfulness: Emotion regulation following a focused breathing induction. *Behav Res Ther* 2006; 44(12): 1849-1858. DOI: 10.1016/j.brat.2005.12.007.
 29. Aftanas L, Golosheykin S. Impact of regular meditation practice on EEG activity at rest and during evoked negative emotions. *Int J Neurosci* 2005; 115(6): 893-909. DOI: 10.1080/00207450590897969.
 30. Ubeyasekara A. 2018. *Five Mental Hindrances (Pancha-nivarana) in Theravada Buddhism*. Available from: <https://drarisworld.wordpress.com/2018/03/09/five-mental-hindrances-pancha-nivarana-in-theravada-buddhism/>.
 31. Luders E, Kurth F, Mayer EA, Toga AW, Narr KL, Gaser C. The Unique Brain Anatomy of Meditation Practitioners: Alterations in Cortical Gyriification. *Front Hum Neurosci* 2012; 6: 1-9. DOI: 10.3389/fnhum.2012.00034.
 32. Ferrarelli F, Smith R, Dencico D, Riedner BA, Zennig C, Benca RM, et al. Experienced Mindfulness Meditators Exhibit Higher Parietal-Occipital EEG Gamma Activity during NREM Sleep. *PLoS One* 2013; 8(8). DOI: 10.1371/journal.pone.0073417.
 33. Lee YH, Shiah YJ, Chen SCJ, Wang SF, Young MS, Lin CL. Improved emotional stability in experienced meditators with concentrative meditation based on electroencephalography and heart rate variability. *J Altern Complement Med* 2015; 21(1): 31-39. DOI: 10.1089/acm.2013.0465.

Appendix 1: Summary of the conceptual framework presented by Yates and colleagues

Stage	Description	Milestone
Stage One	Establishing a practice	
Stage Two	Interrupted attention and overcoming mind-wandering	Milestone One; <i>continuous attention to the meditation object</i>
Stage Three	Extended attention and overcoming forgetting	
Stage Four	Continuous attention and overcoming “gross distraction” (the tendency of a mental or physical object being the centre of attention by pushing the object of meditation away from one’s focus but not out of awareness) and “strong dullness” (extreme drowsiness)	Milestone Two; <i>sustained exclusive focus of attention</i> (A “skilled meditator” is understood to be a meditation practitioner who has passed the stages one to three and is considered to be in stages four through six)
Stage Five	Overcoming “subtle dullness” (a mild dullness which makes the focus on the meditation object less intense and which causes periphery awareness to fade away) and increasing “mindfulness” (optimum interaction between attention and periphery awareness)	
Stage Six	Subduing “subtle distraction” (mild distractions in the background of the periphery awareness that may occur whilst the meditation object still remains as the primary focus)	
Stage Seven	Known as the “transition stage” where a meditator is understood to master exclusive attention through developing the ability to select a specific object and sustain their attention on it even in the presence of competing and distracting stimuli and unify the mind, thus being able to integrate numerous varying types of unconscious and independent mental processes and sub-minds to support a consciously formulated single aim.	Milestone Three; <i>Effortless stability of attention</i>
Stage Eight	Shows qualities of mental pliancy (maintaining stable attention and powerful mindfulness in an effortless manner) and pacifying the senses (temporarily quietening or switching off of one’s physical senses while practicing meditation)	Milestone Four; <i>Persistence of mental qualities of an adept</i>
Stage Nine	Shows physical pliancy (maintaining hours of practice at a time without physical discomfort) and meditative joy (a state of mind that depicts unique joy arising from unifying one’s mind in their practice of meditation)	
Stage Ten	Tranquillity (a serene state of pleasure specifically resulted through meditation) and equanimity (a state of non-reactivity where external and internal stimuli no longer evoke desire or aversion) is achieved.	

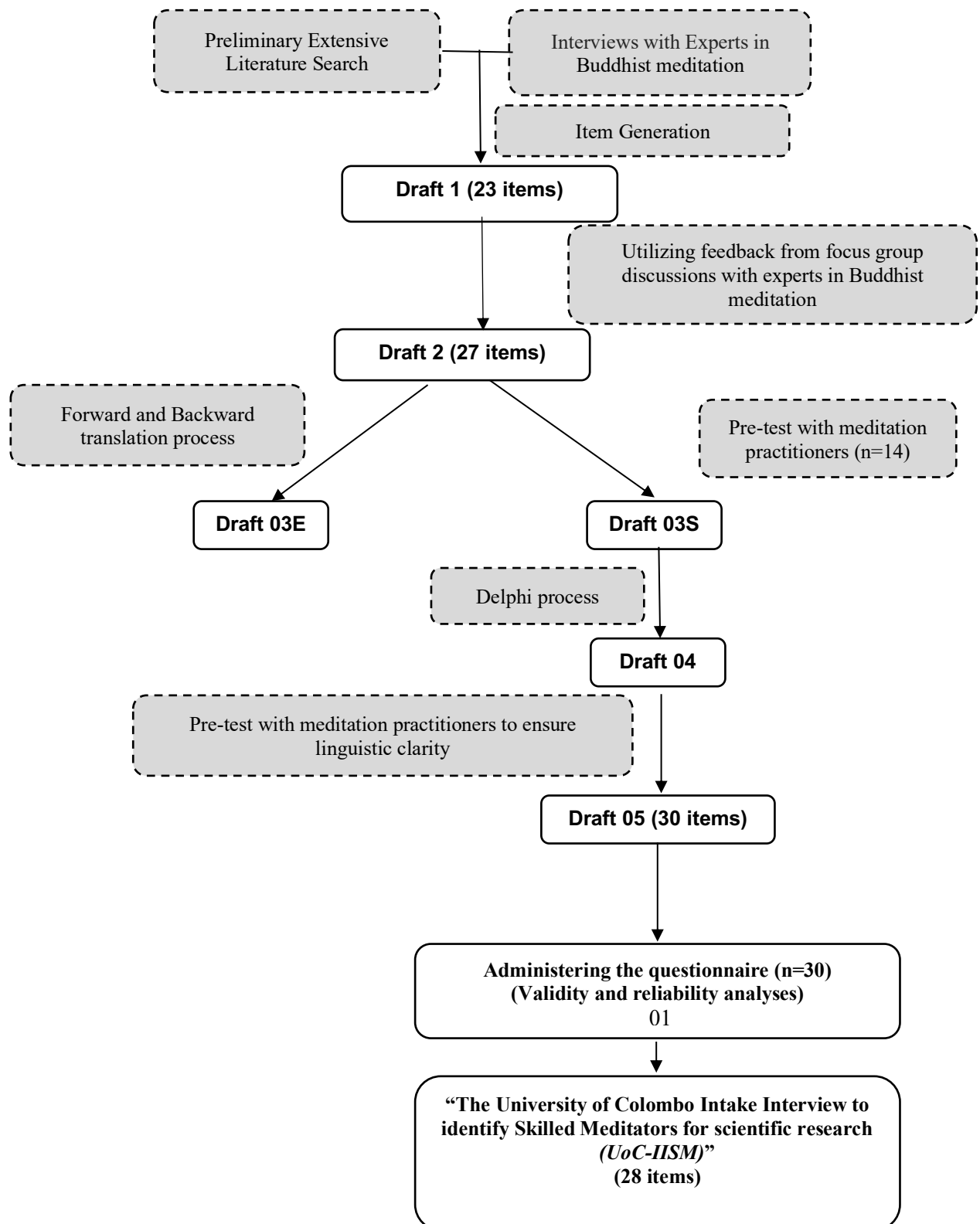


Figure 1: Summary of the development and judgmental validation process of the UoC-IISM