Missing Links in Designing Space for Mindfulness in Secular & Collective Settings: Time, Movements, Perceived Space, & Subject-Object Blurriness

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Introduction

Mindfulness originated in Buddhism and means paying attention in the present moment non-judgmentally[1]. Its benefits include happiness, health[2] [3] ,creativity, and productivity[4].
Little is known of the spatial requirements to produce and support mindfulness. Only a stationary person's brain response to some spatial elements have been discussed, even though people are often in motion or with others. For architecture to contribute to mindfulness in everyday settings, it is urgent to produce a tool to assess what incorporating mindfulness in architecture looks like.

To start this effort, this paper aims to identify the missing links on the obscure path between mindfulness and space and to propose a seed concept model on which to base design for mindfulness.

A literature review is conducted using movements and collectivity as guiding elements. It first looks at the meanings of individual and collective mindfulness. Second, it examines how space is understood in precedents. Based on the findings, it then investigates perceived space when mindful and the influence of movements to mindfulness. Identified gaps include time, movements, perceived space, and subject-object blurriness.

Understanding Mindfulness

There are two approaches to gain individual mindfulness: the Eastern one emphasizes meditation, and the Western one fosters an open awareness of new information[5] through intellectual exercises[6]. The latter is applied oftener in secular settings since it treats "mindfulness as a desired end-result," not a mind-state "found in experience" as in the former[7].

This tendency can lead one to overlook the influence of movements[8] in two instances: when meditation-related movements induce mindfulness and when the resulting movements of

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[1] Kabat-Zinn, Jon. "Mindfulness-Based Interventions in Context: Past, Present, and Future." *Clinical Psychology: Science and Practice* 10, no. 2 (2003): 144-156.
[2] Goleman, Daniel and Richard J. Davidson. *Altered Traits: Science Reveals how Meditation Changes Your Mind, Brain, and Body*. New York: Penguin Random House, 2017.
[3] Killingworth, Matthew A. and Daniel T. Gilbert. "A Wandering Mind is an Unhappy Mind." *Science* 330, (2010): 932.
[4] Langer, Ellen, Michael Pirson, and Laura Delizonna. "The Mindlessness of Social Comparisons." *Psychology of Aesthetics, Creativity, and the Arts* 4, no. 2 (May, 2010): 68-74.
[5] Ie, Amanda, Christelle T. Ngnoumen, and Ellen J. Langer, eds. *The Wiley Blackwell Handbook of Mindfulness*. Vol. I & II. Chichester, UK: Wiley Blackwell, 2014.
[6] Carmody, James. "Eastern and Western Approaches to Mindfulness: Similarities, Differences, and Clinical Implications." In *The Wiley Blackwell Handbook of Mindfulness*, 48-57. Chichester, UK: John Wiley & Sons, Ltd, 2014.
[7] Carmody, "Eastern and Western Approaches to Mindfulness"
[8] Movements include that of eyes, breathing etc.

mindfulness reproduce themselves. For mindfulness to be sustained, the circulatory relationship between mindfulness and movements over time is critical.

Collective mindfulness[9] presents questions regarding collectivity and is defined not as a mind-state or accumulation thereof[10]. It refers to leadership practices[11] that help organizations detect and respond to unexpected events[12]. A desirable end-result of mindfulness becomes its definition here, obscuring the design goals. Bypassing individuals' mind in their collectivity is rooted in psychology: to treat it as an oppositional crowd[13]. Consequences of this approach include the lack of individual mindfulness at the organization's bottom and difficulty to maintain collective mindfulness. Recent research proposes combining bottom-up and top-down approaches[1415], suggesting the necessity of the circulatory relationship between individual and collective mindfulness over time.

Understanding Space

The influence of space on mindfulness has been assessed by examining elements of nature[16] or spatial characters called Perceived Sensory Dimensions (PSDs). Both are independent of people's perception of space. PSDs, such as social, serene, and refuge, are associated with restorative-ness[1718] and are loosely linked to mindfulness. Space is always presumed to influence the mind but never conversely.

This one-sided view leaves challenges to architects, such as the inability to utilize the known effective PSDs for design. How do you recreate the characters of a park labeled 'refuge' in which teenagers feel restored[19] ? Another challenge is missing information on the perceived space, either of the space with known effective PSDs or the one perceived when mindful; furthermore, there is no current notation system to represent perceived space. A previously proposed notation system by this author [20]is not ready for empirical studies. Based on the identified gaps in the above, the following sections examine the perceived space when mindful and the influences of movements to mindfulness.

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[9] Also called organizational mindfulness

[10]Vogus, Timothy J. and Kathleen M. Sutcliffe. "Organizational Mindfulness and Mindful Organizing: A Reconciliation and Path Forward." *Academy of Management Learning & Education* 11, no. 4 (2012): 722–735.

[11]Vogus and Sutcliffe, "Organizational Mindfulness and Mindful Organizing"

[12]Weick, K. E., K. Sutcliffe, and D. Obstfeld. "Organizing for High Reliability: Processes of Collective Mindfulness." *Research in Organizational Behavior* 21, no. 3 (1999): 81–123.

[13]Reicher and Drury. *Collective Behavior, Social Psychology Of*. Second Edition ed. Vol. 4 Elsevier Ltd, 2015.

[14]Vogus and Sutcliffe, "Organizational Mindfulness and Mindful Organizing"

[15]Yu, Lingtao and Mary Zellmer-Bruhn. "Introducing Team Mindfulness and Considering its Safeguard Role Against Conflict Transformation and Social Undermining." *Academy of Management Journal* 61, no. 1 (Feb 1, 2018): 324-347.

[16]Such as sound of water or sun light

[17]Akpinar, Abdullah. "How Perceived Sensory Dimensions of Urban Green Spaces are Associated with Teenagers' Perceived Restoration, Stress, and Mental Health?" 214, (Oct, 2021): 104-185.

[18]Stigsdotter, Ulrika Karlsson, Sus Sola Corazon, Ulrik Sidenius, Anne Dahl Refshauge, and Patrik Grahn. "Forest Design for Mental Health promotion—Using Perceived Sensory Dimensions to Elicit Restorative Responses." *Landscape and Urban Planning* 160, (Apr, 2017): 1-15.

[19]Akpinar, "How Perceived Sensory Dimensions of Urban Green Spaces are Associated with Teenagers' Perceived Restoration, Stress, and Mental Health?"

[20]Kawai, Yoko, Kathleen O'Connor Duffany, and Kathleen A. Garrison. "Blurring the Self/Space Boundary to Increase Mindfulness: Perspectives from Japanese Architectural Philosophy, Neuroscience and Psychology." Academy of Neuroscience and Architecture, September 20-22, 2018

Perceived Space

When mindful, self-space boundaries are blurred[21]. One's internal is externalized and vice versa, leading to simultaneous subject-object separation and unification[22] when the conscious submerges and active intuition of the authentic self[23] extends to the external world[24]. Blurred self-space boundaries are evident in the brain's meditators[25].

Constructs of this blurriness are unilluminated. Within the body, how is it produced, transported, and sensed? Does mindfulness produce the blurriness or vice versa? Little is known of the outer half of blurriness, the space close to one's body.

Peripersonal space (PPS) is a code for the space immediately surrounding the body.[26] It is a perceived nearness[27] and transforms itself according to the emotional significance of objects in it[28]. When a plant box is five-feet away from an employee, her perception of her nearness depends on her posture, the length of her watering can to reach it, and her emotional attachment to it. When spatial conditions change perceived nearness, are they also altering and blurring the perceived edge of her body?

No research has been conducted on a perceived space to determine when collective mindfulness is possible because whose perception of which part of the space to examine are unknown; however, 'atmosphere' and 'Shared Sensory Experience in the PPS' help decipher it.

'Atmosphere' is the quality of in-between spaces[29] not embodied in things or individuals, and is shaped through the continuous changes of the environment and people's practices in it[30]. With its multi-directional and in-between natures, atmosphere combines outside-in and inside-out perspectives of multi-occupant spaces.

Shared Sensory Experience in PPS articulates the transforming spatial perception among multiple people. When an employee's coworker behaves in a trustworthy way, his PPS expands to include this coworker such that stimuli occurring in the coworker's PPS are processed in the same way as for the initial employee[31]. This Shared Sensory Experience occurs bi-directionally[32]

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[21]Kawai, Duffany, and Garrison. "Blurring the Self/Space Boundary to Increase Mindfulness"

[22]Izutsu, Toshihiko. *The Interior and Exterior in Zen Buddhism*. Dallas, Tex.: Spring Publications, 1975.

[23]Nishida, Kitaro. *An Inquiry into the Good* [Zen no Kenkyu (1921)]. Translated by Abe, Masao and Christopher Ives. New Haven; London: Yale University Press, 1990.

[24]Yuasa, Yasuo. *The Body: Toward an Eastern Mind-Body Theory*. SUNY Series in Buddhist Studies., edited by Inada, Kenneth K. [Shintai]. Translated by Nagatomo, Shigenori and Thomas P. Kasulis, edited by Kasulis, Thomas P. Albany, NY: State University of New York Press, 1987.

[25]Josipovic, Dinstein, Weber, and Heeger. "Influence of Meditation on Anti-Correlated Networks in the Brain." *Frontiers in Human Neuroscience* 5, no. Article 183 (January, 2012): 1-11.

[26]Rizzolatti, Giacomo, Luciano Fadiga, Leonard Fogassi, and Vittorio Gallese. "The Space Around Us." *Science* 277, no. 5323 (1997): 190-191.

[27]Gabbard, Carl. "Perception of Action Space: Using Multiple Frames of Reference." In *International Encyclopedia of the Social & Behavioral Sciences (Second Edition)*, edited by Wright, James D., 703-707. Oxford: Elsevier, 2015.

[28]Lloyd, Donna M. "The Space between Us: A Neurophilosophical Framework for the Investigation of Human Interpersonal Space." *Neuroscience and Biobehavioral Reviews* 33, no. 3 (2009): 297-304.

[29]Griffero, Tonio. "Is there such a Thing as an "Atmospheric Turn"? Instead of an Introduction." In *Atmosphere and Aesthetics*, edited by Griffero and Tedeschini, 11-62. Cham: Springer International Publishing, 2019.

[30]Bille. "The Lightness of Atmospheric Communities." In *Atmosphere and Aesthetics*, 241-255. Cham: Springer International Publishing, 2019.

[31]Teneggi, Canzoneri, di Pellegrino, and Serino. "Social Modulation of Peripersonal Space Boundaries." *Current Biology* 23, no. 5 (Mar 04, 2013): 406-411.

by the employee's PPS remapping his coworker's. This explains how an individual's spatial perception affects others, eventually forming the ever-changing collective spatial perception of an atmosphere.

Influence of Movements

Movements, such as walking during *Shinrin-Yoku* (forest bathing), improve mind-state[33], although its proximity to mindfulness is unclear. One's bodily actions and one's altering spatial perception due to one's location changes contribute to this effect.

Resistance training equally mitigates depression as Yoga does[34], which shows that actions of body parts improve our mind without intentional mind-body connection. The Japanese Buddhism practice, *Shugyo*, offers additional insights regarding such connections. It trains the spirit by means of the body through repetitive actions and is also applied in secular settings, such as *Noh* performance practices [35]. This implies that a space could train the moving person's mind, if it can encourage her to repeat certain movements.

In locomotive movement, a person's altering spatial perception influences her mind[3637], especially amid scenic changes[38] [3940]. Improved mood while walking relies on congruent multimodal senses[41],[42], suggesting the importance of non-visual stimuli in perceived space. Traditional walking meditations, which require focus on non-visual sensations,[43] support it.

Shinrin-Yoku and walking meditations are often done in groups, but their collective mental outcome has not been explored. Research on *Shinrin-Yoku* shows the possible importance of its

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[32]Maister, Lara, Flavia Cardini, Giorgia Zamariola, Andrea Serino, and Manos Tsakiris. "Your Place or Mine: Shared Sensory Experiences Elicit a Remapping of Peripersonal Space." *Neuropsychologia* 70, (April, 2015): 455-461.

[33]Furuyashiki, Akemi, Keiji Tabuchi, Kensuke Norikoshi, Toshio Kobayashi, and Sanae Oriyama. "A Comparative Study of the Physiological and Psychological Effects of Forest Bathing (Shinrin-Yoku) on Working Age People with and without Depressive Tendencies." *Environmental Health and Preventive Medicine* 24, no. 1 (Jun 22, 2019): 46.

[34]Miller, Kyle J., Pinyadapat Areerob, Declan Hennessy, Daniela C. Gonçalves-Bradley, Christopher Mesagno, and Fergal Grace. "Aerobic, Resistance, and Mind-Body Exercise are Equivalent to Mitigate Symptoms of Depression in Older Adults: A Systematic Review and Network Meta-Analysis of Randomized Controlled Trials]." *F1000 Research* 9, (2021): 1325.

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[36]Ohno, Ryuzo, Tomohiro Hata, and Miki Kondo. "Experiencing Japanese Gardens: Sensory Information and Behavior." In *Handbook of Japan-United States Environment-Behavior Research: Toward a Transactional Approach*, edited by Wapner, Seymour, Jack Demick, Takiji Yamamoto and Takashi Takahashi, 163-182, 1997.

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[38]Ohno, Ryuzo. "Studies on Environmental Perception during Locomotion—a Review of Empirical Studies by the Ohno Laboratory." *Japan Architectural Review* 1, no. 2 (April, 2018): 194.

[39]Ohno, Ryuzo, Azusa Udagaqa, and Masashi Soeda. "Effects of Emerging Scenes from the Occluding Edges on Visual Attention and Evaluation of the Landscape." *Journal of Architecture and Planning (Transactions of AIJ)* 67, no. 556 (Jun 30, 2002b): 197-203.

[40] Akieda, "Chashitu to Roji no Saikou Tokushitsu."

[41] Wooller, John-James, Jo Barton, Valerie F. Gladwell, and Dominic Micklewright. "Occlusion of Sight, Sound and Smell during Green Exercise Influences Mood, Perceived Exertion and Heart Rate." *International Journal of Environmental Health Research* 26, no. 3 (May 3, 2016): 267-280.

[42]Ohno, Udagaqa, and Soeda. "Effects of Emerging Scenes from the Occluding Edges on Visual Attention and Evaluation of the Landscape."

[43]Kabat-Zinn, Jon. "Walking Meditations." *Mindfulness* 8, no. 1 (2017): 249-250.

human-to-human aspects[44], confirming the importance of the inside-out perspective and in-between spaces. Collective movements have additional aspects that influence participants' mind, such as moving together and altering spatial perception due to their changing relational positions.

Research in dance psychology helps address these challenges. When people dance together, they can feel light, calm, and joyful, which are common appearances of mindfulness, and report blurring self-awareness and heightening fellow-feeling with others [45]. Dance also invites its audience to 'live' the experience of dancers by internally imitating them, which erases the distinction between dancers and the audience[46]. Both processes are similar to Shared Sensory Experiences in PPS.

Conclusions

It is urgent to devise tools to incorporate mindfulness in everyday spatial settings. This paper takes a timely first step toward that aim by identifying the missing links on the obscure path between mindfulness and space (Table-1) and by presenting a novel seed concept model in support (Figure-1). Additionally, it also introduces some concepts that possibly fill the gaps.

Undervaluing the Eastern approach to mindfulness causes a lack of awareness and recognition of movements, and it ignores the inside-out process toward collective mindfulness and the inattention to time, all of which have implications for spatial design.

The one-sided view of spaces when designing for mindfulness prevents utilizing the known effective natures of that space to commune with the actual space and causes one to overlook perceived space.

Movements influence one's mind thorough body actions and altering perceived space due to locomotion. Both are overlooked, and the latter complicates perceived space. The paper identifies the self-space blurriness when individually mindful and the self-other blurriness when collectively in motion as focus areas in further exploring perceived space.

The resulting list and model are not exhaustive and need inputs from business, education, neuroscience, and technology. Future developments include the notation system for perceived space that satisfies conditions identified herein and translation of effective natures of space into actual space.

[44]Furuyashiki, et al. "A Comparative Study of the Physiological and Psychological Effects of Forest Bathing (Shinrin-Yoku) on Working Age People with and without Depressive Tendencies."
[45]McNeill, William H. *Keeping Together in Time*. Hauppauge: Harvard University Press, 1995b.
[46]Yang, Youngeun. "Comprehending Dance through Empathy: A Spectator's Total Body-Mind Experience of Watching Wind of May (Moon, 2020)." *Dance Research* 40, no. 1 (May, 2022): 61-84.

Table 1. Identified Missing Links on the Path between Mindfulness and Space

		Missing Links		Implications for the Spatial Design	Helpful Concepts to Fill the Missing Links
		Missing/undervalued Information	Missing Tools		
Understanding Mindfulness	Individual & Collective Mindfulness	Recognition and natures of movements Circularity between mindfulness and movement		Not knowing the natures of movemen to support Nessecity to include the aspect of time	Eastern approaches to mindfulness
	Colllective Mindfulness	Notion of collectivity looking from inside-out		Obscured goals & means of the design	Mindful organizing (Vogus & Sutcliffe 2012), Team mindfulness (Yu 2018)
Understanding Space	Space that induces mindfulness	Natures of effective PSDs	Spatial language to represent natures of effective PSDs	Inability to translate effective PSDs to actual spaces	
	Perceived space when mindful	Space perceived when mindful	Notation system that capture & represent spatial perception when mindful and in motion	Inability to capture & represent the perceived space when mindful near the body (See Self-space & Self-others blurriness)	Notations for a Participatory Envirotecture (Thiel 1997), Space-travelers' Notation System (Kawai et. al 2018)
	Perceived space when collectively mindful	Perceived In-between Space	Same as above	Inability to capture & represent the perceived in-between space when mindful	Atmosphere (Griffero 2019), Shared Sensory Experience in Peripersonal Space (Teneggi et.al 2013)
Influence of Movements	Individual Movements	Actions of person's body parts Space perceived when mindful & in motions individually (See also 'Self-space blurriness')	Notation system same as in 'Perceived space when mindful', plus inclusion of non-visual senses	Not knowing the natures of movement/behavior to support Nessecity to include non-visual senses	*Shugyo* (Yuasa 1987) Same as for 'Perceived space when mindful'
	Collective Movements	Notion of collectivity looking from inside-out (See 'Collective Mindfulness') Actions of moving together (See 'Self-others blurriness') Space perceived when mindful & in actions collectively (See 'Perceived space when collectively mindful' & 'Self-others blurriness')			
Subject-Object Blurriness	Self-space blurriness when individually mindful	Inner-half of blurriness (origin, process, & sensory appearances) Outer-half of blurriness (spatial conditions near the body)		Not knowing what to be evaluated for a possibly spatial intervention	Prepersonal Space & its expanding/shrinking nature (Gabbard 2015, Loyed 2009)
	Self-others blurriness when collectively mindful	Inner-half of blurriness (origin, process, & sensory appearances) Outer-half of blurriness (spatial conditions near the body & inner-half of blurriness felt by others)		Not knowing what to be evaluated for a possibly spatial intervention	Heightening fellow-feeling when dancing together (McNeil 1995), Internal imitation of dancers by the audience (Yang 2012)

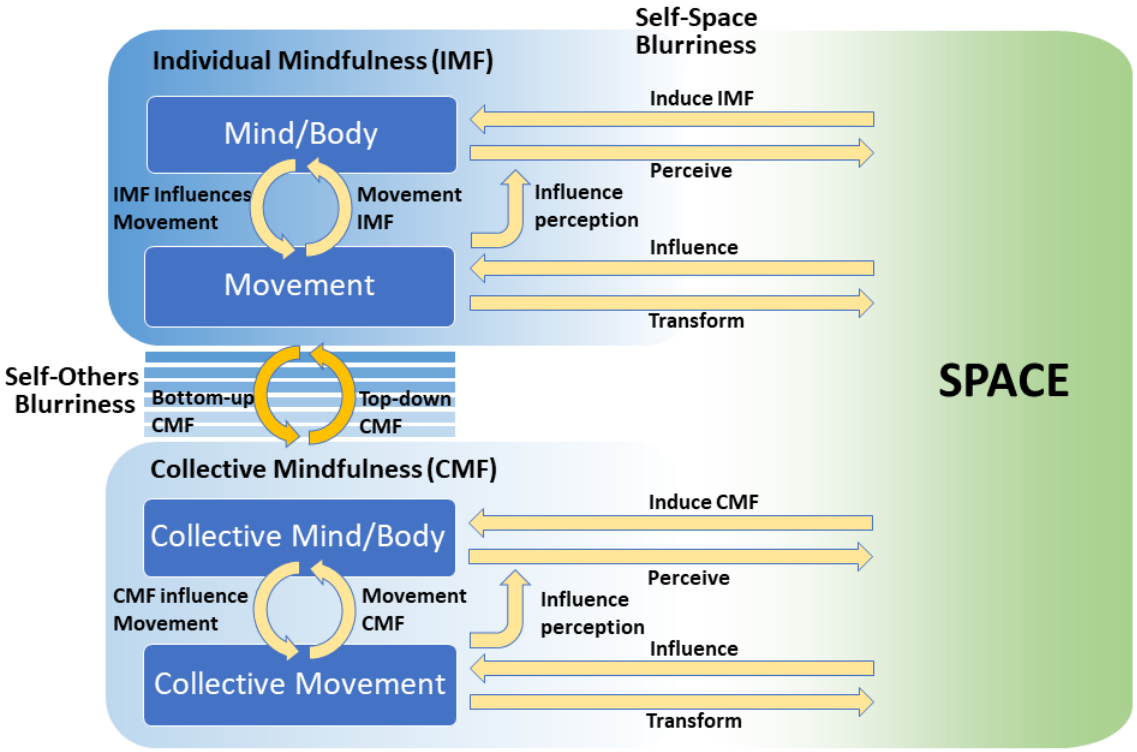

Figure 1. Seed Concept Model on the Path between Mindfulness and Space