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The environmental model of mindfulness

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This paper introduces the environmental model of mindfulness, a novel perspective that conceptualizes mindfulness as an adaptive set of cognitive styles influenced by specific socioecological contexts. Extending upon existing conceptualizations of mindfulness as a cultivated trait or practice, the environmental model describes how mindfulness can also result from cognitive adaptations to immediate-return environments. Through an interdisciplinary synthesis of cognitive psychology, anthropology, and environmental studies, four key factors are identified that foster mindful cognitive styles in immediate-return environments: immediate feedback, observational learning, nature exposure, and interconnected self-construal. By examining Indigenous communities living in immediate-return environments, this paper demonstrates how modern, delayed-return environments may inadvertently suppress innate mindful awareness, suggesting that mindfulness practices might be attempts to recalibrate toward more natural cognitive styles. The environmental model bridges Western medical and Eastern ethical perspectives on mindfulness, offering a unifying framework that acknowledges cognitive, environmental, and cultural influences. This approach not only enriches our understanding of human cognitive functioning but also broadens cultural perspectives on mindfulness, highlighting its manifestations across diverse sociocultural contexts. The model has profound implications for mindfulness research and interventions, providing a foundation for more ecologically valid and culturally sensitive approaches to fostering wellbeing. It invites a fundamental reconsideration of the relationship between human cognition and the environment, potentially revolutionizing our approach to mental health and cognitive enhancement in an increasingly complex world. This paper stands as a call to action for researchers, clinicians, and policymakers to rethink fundamental assumptions about human cognition and design environments that support our innate capacity for mindful awareness.

KEYWORDS

mindfulness, social psychology, ecopsychology, self-construal, nature exposure, wellbeing, indigenous psychology

1 Introduction

Mindfulness, broadly defined as a form of open and present-focused awareness (Brown et al., 2007), has become a central focus in contemporary psychological and therapeutic research (Van Dam et al., 2018; Baminiwatta and Solangaarachchi, 2021; Lee et al., 2021). Research interest in mindfulness has grown exponentially over the past few decades, propelled by consistent findings that mindfulness is associated with a wide variety of beneficial psychological and physical health and wellbeing outcomes (e.g., Creswell, 2017; Tomlinson et al., 2018; Zhang et al., 2021). Despite this abundance of research, a precise definition and clear understanding of mindfulness remains elusive (Chiesa, 2013; Gethin, 2015; Purser and Milillo, 2015; Bravo et al., 2022). As Karl et al. (2022) succinctly put it, “mindfulness works—but what is it?” (p. 174).

Currently, two of the most influential models of mindfulness are the Buddhist ethical model and the Western medical model (Vago and Silbersweig, 2012). The ethical model situates mindfulness within a broader ethical and philosophical framework rooted in ancient traditions and practices. In contrast, the medical model views mindfulness as a malleable psychological trait¹ linked to health and wellbeing outcomes. While these models have advanced our understanding of mindfulness, they often overlook the critical influence of environmental contexts on cognitive processes and could benefit from more inclusive and culturally diverse perspectives (Mehta and Talwar, 2022; Tse, 2022).

The environmental model of mindfulness introduced in this paper addresses this gap by conceptualizing mindfulness not as a trait or practice, but as a group of innate cognitive styles significantly influenced by and adaptive to certain socioecological environments. Specifically, the environmental model posits that these mindful cognitive styles are adaptive in immediate-return environments, where there is little to no temporal gap between actions and outcomes, allowing for immediate feedback and adjustment. This contrasts with delayed-return environments, characteristic of most modern societies, where there is often a significant time lag between actions and their outcomes, necessitating different cognitive adaptations. Furthermore, the environmental model identifies four specific aspects of immediate-return environments that have a strong impact on mindful cognitive styles: immediate feedback on effort, observational learning methods, nature exposure, and an interconnected form of self-construal. Each of these four socioecological factors, and their impact on mindful cognitive styles, are discussed in Section 3. Interestingly, these environmental factors are characteristic of the natural and sociocultural contexts in which humans have lived for over 95% of our history, and in which many Indigenous communities continue to thrive today (Woodburn, 1982; Martin, 1999). The environmental model not only enhances our theoretical understanding but also has significant implications for mindfulness research and practice. It suggests new approaches for cultivating mindfulness that consider environmental factors, potentially leading to more effective and culturally sensitive interventions.

The structure of this paper is as follows: Section 2 explores the conceptualization of mindfulness as an innate form of information processing, aligning with contemporary models of cognition, and also compares the environmental model with existing models. Section 3 examines four key factors that foster mindfulness in immediate-return environments: immediate feedback, observational learning, nature exposure, and cultural influences on self-construal. Section 4 synthesizes these findings,

explores their implications for mindfulness research and practice, proposes directions for future investigation, and discusses the limitations and challenges of this perspective. Throughout the paper, case studies are presented to illustrate key concepts and provide rich contextual examples.

Before moving on to the next section, it is crucial to acknowledge that our understanding of mindfulness is shaped by cultural context, particularly Western perspectives. As we explore mindfulness in diverse cultural settings, we must proceed with cultural humility (Mehta and Talwar, 2022). Our goal is not to impose Western concepts of mindfulness onto other societies, but rather to broaden our understanding by learning about how mindfulness may manifest in other cultures and environments.

2 Mindfulness as an innate form of information processing

Recent advances in cognitive psychology, neuroscience, and environmental psychology have revealed the strong impact that environmental factors have on cognitive processes. This influence is particularly salient in the context of mindfulness, which involves engaging with the world through direct sensory experiences rather than abstract mental activities such as planning for the future or reflecting on the past. Contemporary models of cognition describe a hierarchical system of information processing (Friston, 2008; Carhart-Harris and Friston, 2019). At the lower levels, we process direct, concrete, and immediate sensory information (e.g., tasting an apple). At higher levels, we process abstract, conceptual, and “temporally thick” information (i.e., further away in time from the present moment), such as planning a grocery list (Kozhevnikov et al., 2014; Carhart-Harris and Friston, 2019; Laukkonen and Slagter, 2021). These different processing modes are termed “cognitive styles”—adaptive systems that adjust to various environmental contexts and requirements (Kozhevnikov, 2007). Crucially, cognitive styles are more immediately and strongly shaped by our environments than psychological traits, allowing rapid adaptation to changing contexts. Broad categories of related cognitive styles exist across the concrete-to-abstract information processing hierarchy; for example, the “rule-based versus intuitive” category includes a narrow-focused attention style and a broad-awareness attention style at the lower, more concrete, level of information processing and divergent thinking and convergent thinking styles at the higher, more abstract, level of information processing (Kozhevnikov et al., 2014).

Mindfulness aligns with lower-level processing in this hierarchy, focusing on immediate, concrete sensory experiences rather than abstract concepts (Kabat-Zinn, 2003; Baer et al., 2006; Brown et al., 2007). For instance, listening to a dog barking in the distance without overlaying a judgment on that sensory experience represents lower-level concrete processing. Forming a judgment and conceptualization of a “bad dog owner” or “bad neighbor” and planning ways to complain represent higher-level abstract processing. The former would be an example of mindfulness; the latter would not. Therefore, *the environmental model conceptualizes mindfulness as a broad category of cognitive styles at these lower, concrete levels of information processing*. The specific cognitive styles within this “mindful cognitive styles” category may vary

¹ While contemporary Western mindfulness research has largely converged on the construct of trait mindfulness (Lee et al., 2021), in part due to its measurable long-term characteristics and implications for health and wellbeing, other mindfulness-related constructs continue to be researched. Prominent examples are the more temporary and transient state mindfulness (e.g., Bishop et al., 2004; Tanay and Bernstein, 2013), relational and social manifestations referred to as interpersonal mindfulness (e.g., Pratscher et al., 2019; Deits-Lebehm et al., 2022), as well as the emergence of group- and company-level mindfulness known as organizational mindfulness (e.g., Vogus and Sutcliffe, 2012; Sutcliffe et al., 2016).

in attentional scope (narrow to broad) and target (external vs. internal; Kozhevnikov et al., 2014), but all involve immediate sensory processing.

Higher levels of the processing hierarchy involve increasingly abstract representations of the world, enhancing our ability to forecast future scenarios (Baird et al., 2011; Ruby et al., 2013; Medea et al., 2018; Kyavilashvili and Rummel, 2020; Laukkonen and Slagter, 2021). Abstraction is a cognitive process which involves forming conceptual meanings (e.g., the concept of “dog”) by identifying similarities across different sensory experiences (Gentner and Smith, 2013). This process helps us develop general knowledge and apply learning to new situations. Different levels or degrees of abstraction occur at different levels in the information processing hierarchy, with more abstracted and inclusive concepts (e.g., “animals”) being processed at higher levels, and more specific and exclusive concepts (e.g., “small dogs”) being processed at relatively lower levels. Key aspects of abstract processing include mind-wandering and self-referential thought (Margulies et al., 2016; Menon, 2023), self-construal and identity formation (Markus and Kitayama, 1991), and future scenario modeling (Metzinger, 2013; Friston, 2018; Laukkonen and Slagter, 2021). While abstraction is adaptive and essential for many cognitive tasks, excessive abstract processing can lead to rumination and anxiety—states that mindfulness practices aim to reduce. Abstraction is crucial to the processing of self-relevant information, in fact, the concept of self has been referred to as a cognitive abstraction which helps to predict future scenarios, as one needs to take into account personal interests, habits, and behaviors when forecasting future outcomes (Metzinger, 2013; Friston, 2018; Laukkonen and Slagter, 2021).

Research demonstrates that mindfulness-based programs (MBPs) result in more frequent utilization of lower-level concrete information processing and relatively less frequent higher-level abstract information processing. Intriguingly, since self-referential processing and self-construal involve abstract cognitive styles, MBPs also reduce both of these processes, resulting in shifts in how people relate to their internal thoughts, identifying with them less—a phenomenon known as decentering (Sedlmeier et al., 2012; Wells et al., 2019). Interestingly, decentering mediates the positive effects of mindfulness on health and wellbeing outcomes (Shoham et al., 2017; Fuochi and Voci, 2020; Hanley et al., 2020). These changes in self-construal are central to the Buddhist ethical model, where mindfulness practices aim to cultivate such changes (Bodhi, 2011, 2016; Nilsson and Kazemi, 2016; Lomas, 2017), but are not considered a core part of the Western medical model.² Because of this discrepancy, distressing experiences have been reported

by practitioners unprepared for such fundamental shifts in self-perception (Lindahl, 2017; Lindahl and Britton, 2019).

The environmental model’s conceptualization of mindfulness as a broad category of concrete cognitive styles contributes to the existing literature in several ways. First, it helps to explain why mindfulness practices are associated with changes in self-construal—as they reduce the utilization of abstract cognitive styles, including self-referential thought and identity formation. Second, it reconciles opposing views of mindfulness as either a specific cognitive style (Demick, 2014) or a construct broader than any one particular cognitive style (Langer and Moldoveanu, 2000). It also removes value judgments often associated with the term “mindfulness”; for example, cognitive styles associated with lower-level concrete information processing (i.e., mindful cognitive styles) are not inherently “better” than cognitive styles associated with higher-level abstract information processing (forms of which are sometimes referred to as being “mindless”). While abstract processing such as problem-solving, planning, and creative thinking often occur during mind-wandering episodes, they are essential functions that help us predict and plan for future scenarios (Baird et al., 2011; Ruby et al., 2013; Stawarczyk et al., 2013). Such abstract cognitive styles can therefore be seen as adaptive forms of information processing. This conceptualization of mindfulness as an innate and adaptive category of cognitive styles also explains the natural variability in trait mindfulness within populations, even among those without prior mindfulness practice (Brown and Ryan, 2003).

While this conceptualization overlaps with existing models, it also presents important differences. The medical model most frequently portrays mindfulness as a trait, defined as “the awareness that arises through paying attention on purpose, in the present moment, and non-judgmentally to the unfolding of experience moment by moment” (Kabat-Zinn, 2003, p. 145). Trait mindfulness is associated with wellbeing and health and can be cultivated primarily through various mindfulness practices or MBPs. Additionally, the medical model identifies state mindfulness, which is more time-bound and often induced through MBPs or other mindfulness practices. Both the medical model and the environmental model emphasize present moment awareness, which can manifest over longer-term (trait-like) and shorter-term (state-like) durations of time. While the medical model explicitly includes non-judgment as a key facet alongside awareness (Shapiro et al., 2006), the environmental model does not recognize non-judgment as a distinct component. However, the cognitive process of judgment involves abstract cognitive styles, which provide a hierarchical value framework for making judgments. Consequently, adopting more mindful cognitive styles can reduce judgment, aligning with recent research suggesting that non-judgment may naturally occur at lower levels of the information-processing hierarchy (Laukkonen and Slagter, 2021). A key difference between these models is the environmental model’s acknowledgment of the dynamic connection between cognition and environment. This perspective extends beyond the purely medical and psychological domains into fields such as social psychology, sociology, environmental studies, and anthropology, highlighting the broader implications and interdisciplinary nature of the environmental model.

² Examples of Western researchers who have included changes in self-construal in their conceptualization of mindfulness include Leary and Diebels (2017), who stated that, “at its foundation, mindfulness involves ways of processing self-relevant information that differ from how people typically think about themselves when not being mindful, and that these processing differences are responsible for many, if not most, of the effects of mindfulness” (p. 50), as well as, more simply, “at its core, mindfulness involves a distinct way of thinking about oneself” (p. 51), along with Jankowski et al. (2022), who stated that “practicing mindfulness influences how we perceive ourselves” (p. 1).

The ethical model views mindfulness as part of a broader ethical and philosophical system. In this model, mindfulness is a form of intentional and effortful practice which leads to changes in the way the self is experienced and construed (Bodhi, 2011, 2016; Purser and Milillo, 2015; Nilsson and Kazemi, 2016; Lomas, 2017). As Bodhi described, “in its classical role, as an integral component of the Buddhist path, the purpose of mindfulness meditation is to eradicate the mind’s deep defilements and uproot the belief in a substantial self” (Bodhi, 2016, p. 5). While the environmental model does not include an ethical or philosophical system and is instead focused on the dynamic interplay between the environment and cognition, the environmental model does emphasize and attempt to explain how mindfulness and self-construal are related. It furthers the understanding of this relationship by identifying a bidirectional effect—that is, while in the ethical model, mindfulness practices lead to changes in self-construal, the environmental model reveals how changes in self-construal (e.g., from more independent to more interconnected) can likewise lead to more frequent use of mindful cognitive styles (as described in detail in Section 3.4).

In summary, the environmental model conceptualizes mindfulness as a broad category of related cognitive styles that process direct, concrete, and immediate sensory information at lower levels of a hierarchical information processing system. This perspective aligns with modern models of cognition and enables an explanation of how environmental factors can have a strong influence on mindfulness, as cognitive styles are, by definition, strongly influenced by environmental contexts (Kozhevnikov et al., 2014). This overview sets the stage for reviewing how specific factors of immediate-return environments naturally foster mindful cognitive styles.

3 Environmental influences on mindful cognitive styles

The environmental model describes how mindfulness, conceptualized as a category of concrete cognitive styles, is highly influenced by environmental contexts. This relationship between environment and cognition is receiving increased interest across various disciplines, including anthropology, psychology, and sociology. Both macro-level factors (e.g., subsistence strategies) and micro-level factors (e.g., familial and educational environments) significantly influence cognitive styles (Berry, 1967; Nisbett et al., 2001; Kozhevnikov et al., 2014; Talhelm et al., 2014). For instance, agricultural communities tend to exhibit more abstract, long-term thinking compared to foraging communities (Woodburn, 1982; Martin, 1999). Even within agricultural communities, the type of crop cultivated can influence different cognitive styles. The cultivation of wheat, which requires less community support, may foster an abstract cognitive style that is more independent (e.g., independent self-construal). In contrast, rice cultivation, demanding greater community involvement, may promote an abstract cognitive style that is more interdependent (e.g., interdependent self-construal; Talhelm et al., 2014). These variations affect attentional allocation—toward individual goals or group objectives, respectively (Nisbett et al., 2001). These

examples demonstrate the profound relationship between broad environmental factors and cognition.

In exploring the influence of environmental factors on mindful cognitive styles, this paper focuses on the distinction between immediate-return and delayed-return environments. Immediate-return environments, characterized by short-term reward structures, are typically associated with nomadic foraging communities that do not store surplus resources. A key feature of these environments is minimal manipulation of the natural surroundings (Woodburn, 1982; Brunton, 1989; Martin, 1999; Martin and Shirk, 2008). Individuals in these environments have a reduced need for mental simulation and future-scenario modeling—processes associated with abstract cognitive styles—as they receive rapid, often immediate feedback on their goal-related efforts (Turnbull, 1962; Meillassoux, 1973; Barnard and Woodburn, 1988; Brunton, 1989; Martin and Shirk, 2008). The prompt consumption rather than storage of gathered resources (e.g., food) also reduces the need for abstract cognitive styles (Woodburn, 1988; Martin and Shirk, 2008; Everett, 2010). Therefore, such immediate-return environments facilitate a strong present-moment awareness (Forde and Douglas, 1956; Martin, 1999; Martin and Shirk, 2008) and require less abstract information processing, such as long-term planning or rumination on past and future events (Woodburn, 1982; Brunton, 1989; Martin, 1999). As Martin and Shirk (2008) noted, “this relatively immediate feedback allows members of immediate-return societies to maintain an extreme focus on the present” (p. 168). Forde and Douglas (1956) similarly observed that individuals in such environments “are bound to the momentary present... never forecasting the distant future, and seldom making provisions for the near future” (p. 332). This reduced need for and utilization of abstract cognitive styles aligns with findings from cognitive psychology and neuroscience, which identify abstract cognitive styles as instrumental in long-term planning and forecasting—mental processes which are less adaptive in immediate-return environments.

In contrast, delayed-return environments, prevalent in modern industrialized settings, are characterized by complex physical and social systems that introduce a temporal gap between goal-directed effort and outcomes. These environments feature heavily modified landscapes and economic systems based on accumulation, ownership, and social hierarchies (Woodburn, 1982; Martin, 1999). Such contexts necessitate long-term planning and abstract cognitive styles to navigate complex structures and optimize future outcomes. Because of this, research suggests that individuals in delayed-return environments spend up to 50% of their time mind-wandering and abstracting away from the present moment (Kane et al., 2007; Killingsworth and Gilbert, 2010; Song and Wang, 2012), with most of this mind-wandering focused on the future³ (Smallwood et al., 2009, 2011; Baird et al., 2011; Andrews-Hanna et al., 2014). While this tendency toward more frequent use of abstract cognitive styles is in opposition to mindfulness (i.e., more frequent use of concrete cognitive styles), these abstract cognitive processes can be adaptive in contexts with multiple long-term goals

³ Although there is individual variability in the temporal direction of mind-wandering (Welhaf et al., 2020).

disconnected from the immediate environment (Baird et al., 2011; Ruby et al., 2013; Stawarczyk et al., 2013). Consequently, these abstract cognitive styles have been termed “delayed-return skills” (Martin, 1999) or “delayed-return ways of thinking” (Salali and Migliano, 2015), emphasizing their adaptive nature in delayed-return environments.

In summary, immediate-return environments appear to organically foster a strong awareness of the present moment and require less abstract information processing (Woodburn, 1982; Brunton, 1989; Martin, 1999). This natural cultivation of mindful cognitive styles, occurring without intentional practice, represents a core contribution of the environmental model. To illustrate these concepts, we now examine examples from various Indigenous communities living in contexts that embody aspects of immediate-return environments.

Case study 1: the Pirahã

The Pirahã, a nomadic foraging community in the Amazon Rainforest, offer a compelling example of how immediate-return environments shape mindful cognitive styles. Anthropologist Daniel Everett’s three-decade study of the Pirahã revealed their profound emphasis on present-moment experience and notable lack of interest in long-term planning or abstract thinking (Everett, 2010). A striking feature of Pirahã culture is their language, which lacks words for abstract concepts or future-oriented planning. Everett noted that “the Pirahã language and culture are connected by a cultural constraint on talking about anything beyond immediate experience” (p. 130). This linguistic characteristic both reflects and reinforces their present-focused cognitive style. For instance, the absence of a word for “worry” in their language corresponds with Everett’s observation that the Pirahã rarely, if ever, expressed anxiety about the future. Everett termed this cultural emphasis on present-moment experience the “immediacy of experience principle” (2010). The Pirahã’s daily activities center around immediate needs and experiences. They gather food as needed, seldom store surplus, and their social interactions primarily focus on current events and immediate surroundings. As Everett described, “the Pirahãs don’t store food, they don’t plan more than one day at a time, they don’t talk about the distant future or the distant past—they seem to focus on now, on their immediate experience” (p. 130). This extreme present focus is enabled by their environment, which the Pirahã perceive as hospitable and providing for their needs year-round. This allows them to rely on their daily gathering efforts without the need for long-term resource storage or planning. Everett mentions that by making the immediate their focus, “the Pirahãs simply... eliminate huge sources of worry, fear, and despair that plague so many of us in Western societies” (p. 272). Importantly, Everett noted that “the Pirahãs have built their culture around what is useful to their survival” (p. 272), indicating that prioritizing concrete, mindful cognitive styles is advantageous in their environmental context, demonstrating the adaptive nature of mindful cognitive styles in immediate-return environments. This case study vividly illustrates how an immediate-return environment can naturally cultivate mindful cognitive styles. It provides a stark contrast to the more abstract, future-oriented cognitive styles prevalent in delayed-return environments.

Case study 2: the Mbuti

The Mbuti of the Ituri Rainforest in the Democratic Republic of the Congo provide another compelling example of how immediate-return environments foster mindful cognitive styles. Anthropologist Colin Turnbull’s 3-year immersive study with the Mbuti revealed their intense emphasis on and prioritization of present-moment experience (Turnbull, 1983). Turnbull observed that the Mbuti’s focus on the present was all-encompassing in both time and space. He cited Mbuti statements such as, “If it is not here and now what does it matter where (or when) it is?” (p. 122), which vividly illustrate their present-centered worldview. The Mbuti perspective on time is one where “things are never what they were, they are always whatever they are, and that is the only reality we can deal with, or should try to deal with, the ‘now’” (p. 122). A striking example of this present-moment awareness was observed when a Mbuti individual “paddled around in the water, looking at his reflection and at the trees above, one after the other, he was considering the nature of the ‘here’” (p. 122). Turnbull’s description portrays an individual using their full sensory apparatus to understand, almost to “feel,” the nature of the present moment, rather than relying on abstract or conceptual reasoning. This emphasis on present-moment experience is viewed as adaptive in the Mbuti’s environmental context. Turnbull described the Mbuti as “a practical people whose physical existence is determined, in detail, by day-to-day context, they are far more concerned with the present than they are with the past or the future” (p. 246). The Mbuti “eschew speculation of the future on the grounds that not having been there they do not know what it is like, and not knowing what it is like they cannot predict what their behavior will be” (p. 246–247). For the Mbuti, attempting to predict the future (which involves abstract cognitive styles) is akin to “walking blindly.” Their skepticism extends to abstract concepts like the afterlife, challenging those who claim such knowledge with questions like “How do you know. Have you died and been there?” (p. 247). Those who claim knowledge of such abstract concepts or speculate about future events are seen as acting “emptily” and having “loose heads,” and Turnbull noted that for the Mbuti, “such speculation was considered fruitless, and took the form of legend and was listened to with interest, and often with amusement” (p. 247), underscoring their strong preference for direct, immediate experience (i.e., mindful cognitive styles) over abstract thought. This case study, like that of the Pirahã, demonstrates how the Mbuti prioritize concrete cognitive styles, which are adaptive in their immediate-return environmental context. It provides further evidence of how such environments naturally cultivate mindful cognitive styles, characterized by intense present-moment awareness and a de-emphasis on abstract, future-oriented thinking.

Case study 3: the Pintupi

The Pintupi, an Australian Aboriginal community, offer a unique perspective on present-moment awareness in a transitional context. Despite moving from a fully immediate-return environment to a somewhat more delayed-return setting due to environmental pressures such as drought (Myers, 1991), the Pintupi maintain a strong focus on present-moment awareness. Anthropologist Fred Myers, who has worked with the Pintupi since 1973, characterized their world as “dominated by immediacy”

(p. 125). In Pintupi culture, the ability to maintain constant awareness of the present moment in both the natural and social environment is a fundamental expectation of adulthood. Myers observed that “there is constant evaluation of the state of the social and physical world” (p. 108) among Pintupi adults. This continual assessment keeps their awareness firmly rooted in the present moment, prioritizing mindful over abstract cognitive styles. In fact, the Pintupi view the inability to maintain awareness of the present-moment experience, or having an overly busy or preoccupied mind, as signs of immaturity or even mental illness (Myers, 1991; Petchkovsky, 2000). This case study illustrates how deeply ingrained present-moment awareness can be in a culture, and how present-moment awareness is not just a cognitive preference for the Pintupi, but a core cultural value tied to concepts of maturity and mental health.

The case studies of the Pirahã, Mbuti, and Pintupi offer compelling insights into the natural manifestation of mindful cognitive styles in immediate-return environments. These examples illuminate a dimension of mindfulness often overlooked in contemporary research: its natural, effortless expression in societies intimately attuned to their immediate surroundings. Historically, research on mindfulness has been predominantly conducted within the context of delayed-return environments, particularly Western industrialized cultures. This narrow focus, coupled with early 20th-century anthropological biases on the cognitive ability—the ability to process abstract information—of Indigenous communities (Hallpike, 1979), has potentially limited our understanding of mindfulness. Fortunately, more recent work in anthropology has recognized that people living in immediate-return environments possess equivalent cognitive capabilities but employ different cognitive styles optimally adapted to their environmental contexts (Lévi-Strauss, 1966; Luhrmann, 2021).

This section demonstrates how the environmental model not only highlights the dynamic interplay between environment and different cognitive styles, but also invites us to consider mindfulness through a broader and more culturally-inclusive lens. The model provides a novel conceptualization of mindfulness as a category of adaptive cognitive styles influenced by specific ecological and social contexts. In the following sections, we examine four key environmental factors that contribute to the manifestation of mindful cognitive styles in immediate-return environments.

3.1 Immediate feedback

One of the primary drivers of mindful cognitive styles in immediate-return environments is the immediacy of feedback on goal-directed effort. While the term “immediate” appears in both “immediate feedback” and “immediate-return environments”, it is important to acknowledge that immediate feedback is just one component of these complex environmental contexts.

The immediacy of feedback is a key factor distinguishing immediate-return from delayed-return environments, playing a crucial role in influencing mindful vs. abstract cognitive styles (Martin and Shirk, 2008). According to I-D compensation theory (Martin, 1999), humans have an innate predisposition toward receiving frequent and relatively immediate feedback on goal

performance, having evolved in such environmental conditions. When feedback is delayed, as in delayed-return environments (the “D” in “I-D”), humans employ adaptive cognitive strategies to compensate (hence “compensation”). These strategies involve various abstract cognitive styles that serve to infer and estimate progress toward longer-term goals in the absence of direct and immediate (the “I” in “I-D”) feedback. Martin (1999) referred to such abstract cognitive styles as “delayed-return skills” (p. 198). In the context of I-D compensation theory, these skills are described as a form of coping mechanism for organisms with immediate-return predispositions living in a delayed-return world (Martin et al., 2014). Martin et al. (2014) proposed that the presence of immediate feedback in immediate-return environments reduces the need for such coping mechanisms (i.e., abstract cognitive styles) and cultivates a natural state of mindfulness.

An illustrative example comes from a study by Salali and Migliano (2015) on the Mbendjele BaYaka, an immediate-return nomadic foraging community in the Democratic Republic of the Congo. Following the completion of a task, members of the Mbendjele BaYaka were given the choice of receiving one unit of food the same day or five units the following day. Those living in the traditional immediate-return environment chose to receive one unit of food the same day (the immediate return), compared to a separate group of Mbendjele BaYaka who now lived in a more delayed-return environment in a nearby town; they chose to receive five units of food the following day (the delayed return). These findings reveal that living in an environment with immediate feedback leads to more immediate and present-oriented concrete cognitive styles and a higher level of delay discounting, resulting in a prioritization of immediate rewards. Salali and Migliano (2015) concluded that such present-oriented concrete cognitive styles and the increase in delay discounting are adaptive in immediate-return environments. Importantly, the study also showed that these cognitive styles and delay-discounting behavior are malleable and adjust to different environmental contexts, as seen in the lower levels of delay discounting in the Mbendjele BaYaka group now living in the nearby town. The authors discussed the cyclical and self-perpetuating effects that result from the decisions made by people in these different environments (as proposed by Martin et al., 2014). For example, by choosing an immediate reward, the Mbendjele BaYaka living in the immediate-return environment reinforce the use of more concrete cognitive styles, thereby encouraging higher levels of delay discounting in the future.

An increased reliance on abstract cognitive styles may also be adaptive in modern delayed-return environments. In addition, an overreliance on mindful cognitive styles might not be beneficial in this context, as it may hinder long-term goal accomplishment. Given this possible tradeoff between long-term goal attainment and mindful cognitive styles (which are associated with higher levels of wellbeing; Creswell, 2017; Tomlinson et al., 2018; Zhang et al., 2021), Martin proposed that people in delayed-return environments structure long-term goal pursuits by first breaking down goals into multiple sub-tasks (i.e., utilizing abstract cognitive styles) and then focusing their attention on the tasks they are doing in the present moment (i.e., utilizing mindful cognitive styles). In this way, progress can be made toward long-term goals while embedding more frequent points of feedback and enabling

attention to be fully focused on the current task, leading to more frequent utilization of mindful cognitive styles and the satisfaction of innate immediate-return needs. As Martin mentioned, it may be possible to “live in the present without living for the present” (Martin et al., 2014, p. 307).

Research in industrial/organizational psychology supports this perspective. Even within modern industrialized delayed-return environments, research has found that delays between expended effort and feedback on that effort negatively affect one’s ability to sustain attention on work tasks and reduce attention-related states that have some conceptual overlap (along with important differences) with mindfulness, such as flow (Nakamura and Csikszentmihalyi, 2002) and work absorption (Roche and McConkey, 1990), while also increasing mind-wandering (Sipowicz et al., 1962; Mackworth, 1964). Timely feedback on goal-related behavior has also been recognized to affect overall work performance (Sleiman et al., 2020) and is recognized in goal-setting theory (Locke and Latham, 1990) as a key influential factor on this outcome. Employees require regular and timely feedback throughout the goal-achieving process to ensure that consistent progress is made toward goals and to decide whether they should continue to invest effort in a particular strategy or change their approach (Locke and Latham, 1990).

In summary, one of the key environmental factors of immediate-return environments that influence the prevalence of mindful cognitive styles is the immediacy of feedback on goal-directed effort. Environments that provide immediate performance-related feedback reduce the need for so-called “delayed-return skills”—abstract cognitive styles including processes such as mind-wandering and future-scenario simulation—and naturally cultivate more frequent use of mindful cognitive styles. Environments that lack such immediate feedback require more frequent use of abstract cognitive styles, which can be seen as adaptive compensations that provide abstracted inference and estimations regarding one’s trajectory toward achieving long-term goals. Understanding the role of immediate feedback in fostering mindfulness has important implications for mindfulness research and interventions in delayed-return environments. To cultivate mindfulness in these contexts, we might consider implementing more immediate feedback mechanisms in various settings. For example, more frequent and timely performance feedback may reduce the reliance on abstract cognitive styles in employees and students. In addition, activities which require sustained awareness and provide immediate performance-related feedback could be incorporated into MBPs.

3.2 Observational learning

Observational learning is a second key factor that explains the increased presence of mindful cognitive styles in immediate-return environments. In such environments, learning occurs primarily through observation, followed by eventual participation in community activities (Paradise and Rogoff, 2009; Gaskins and Paradise, 2010). This approach to learning fosters mindful cognitive styles as it emphasizes direct experience and sustained attention (Paradise and Rogoff, 2009). The defining feature of this

learning style is its reliance on observation (Lee, 1967; Gaskins and Paradise, 2010) and emphasis on the learner’s “keen attention to ongoing events” (Paradise and Rogoff, 2009, p. 107). This kind of observational and experiential learning engages many of the learner’s senses and develops the capability for sustained awareness (Maurer, 1977; Paradise and Rogoff, 2009). In other words, this form of learning utilizes and develops mindful cognitive styles.

Observational learning is a highly evolved practice developed over millennia, requiring a high degree of skill and collaboration among community members for its successful implementation (Luhmann et al., 2011). It is embedded across all parts of community life (Gaskins and Paradise, 2010), and its naturalness and ubiquity have been compared to how language is learned (Paradise and Rogoff, 2009). Importantly, this style of learning requires and cultivates “open attention” (Gaskins and Paradise, 2010), described as “attention that is both wide angled and abiding” (p. 113), involving “calm mindful attention to surrounding events” (Luhmann et al., 2011, p. 37). This form of open attention includes a distributed scope of awareness across a wide field of sensory inputs, and has “intriguing similarities to the Buddhist practice of mindfulness” (Gaskins and Paradise, 2010, p. 115). This form of open awareness is very similar to the broad-awareness cognitive style mentioned earlier (as part of the “rule-based vs. intuitive” category of cognitive styles).

Examples of this form of learning are frequently found among Indigenous communities across North and South America. Maurer (1977) described children in the Mayan Tzeltal, an Indigenous-heritage community in Mexico, saying that “even a young child can stay for long periods of time in almost absolute immobility, watching attentively what the adults are doing” (p. 94). Maurer also said of the Ma’zahua, an Indigenous-heritage community of Central Mexico, that “very young children, even babies, can often be seen holding themselves stock-still while intently watching a person or activity, almost without blinking, completely absorbed” (p. 94). Other researchers have found that Mayan infants have “much more control over directing their attention to the social and physical world around them” compared to Western infants (Luhmann et al., 2011, p. 42). Additional studies have found that Guatemalan Mayan mothers and their infants were able to distribute their attention more broadly and across multiple objects and events simultaneously, whereas Western mothers and infants applied their attention serially and in short but discrete time segments (Chavajay and Rogoff, 1999). This more wide-angled and distributed attention has advantages for learning through observation, including event detection, awareness of contextual information, and a general ability to process a broader range of information. As Luhmann et al. (2011) stated, “when open attention is habitually practiced, much more subtle information can be inferred” (p. 43).

This kind of learning style and its associated open attention have been described as effortless (Gaskins and Paradise, 2010) and as a natural and default way that attention is applied throughout everyday life. Indigenous communities that emphasize this kind of open attention expect children to master these observational skills, and doing so is a sign of increasing maturity into adulthood (Chavajay, 1993). In addition, in communities that practice this form of learning, children are typically considered key members of the community and are expected

to observe and eventually participate in day-to-day activities alongside adults (Paradise and Rogoff, 2009). In this context, the learning goals are self-evident and clearly tied to valuable activities that support the broader community; therefore, this form of learning results in high levels of intrinsic motivation, supporting sustained awareness (Paradise and Rogoff, 2009; Luhrmann et al., 2011). While primarily observational, this method of learning also includes occasional verbal interaction between the learner and the teacher, though such interactions are used in support of the direct experience of events (Paradise and Rogoff, 2009).

In contrast, this way of learning is not commonly valued in modern Western and other industrialized delayed-return environments (Paradise and Rogoff, 2009). In these environments, learning is more formalized, typically occurs in a context that is separated from the environment in which the skills being learned are applied (Bruner et al., 1961), and is primarily conducted via adult mediation of children's attention toward specific objects or events, rather than relying on the child's intrinsic motivation and broad awareness. As mentioned by Paradise and Rogoff (2009), this more formalized, structured, and theoretical (as opposed to practical) approach to learning in modern Western society is "abstract" and "assembly-line-like" (Rogoff et al., 2003), a "building-block method of instruction" (Hall, 1991). Unsurprisingly, then, this form of learning results in the prioritization and development of more abstract cognitive styles. In addition, this abstract form of learning prioritizes a form of attention which is "narrowly focused and sustained in bursts" (Luhrmann et al., 2011, p. 43), and is associated with distractibility and mind-wandering (Gaskins and Paradise, 2010).

In summary, the observational approach to learning, commonly practiced among communities living in immediate-return environments, cultivates a natural form of broad and open awareness that is easily maintained and common across all forms of daily life, for both children and adults alike. This broad and present-focused awareness represents a mindful cognitive style. In contrast, delayed-return environments prioritize a form of learning that cultivates abstract cognitive styles along with narrow forms of attention that are difficult to sustain, leading to distraction and mind-wandering. Understanding the role of observational learning in fostering mindfulness has important implications for mindfulness research and interventions in delayed-return environments. To cultivate mindfulness in these contexts, we might consider implementing observational learning components into lessons or tasks. For example, rather than first receiving instruction on how to complete a task, students could first be encouraged to calmly observe as a teacher demonstrates an action or activity, and then proceed when they are ready. Opportunities for observational learning could also be considered in the workplace, as opposed to more abstract and theoretical learning methods. In addition, activities that incorporate aspects of observational learning could be incorporated into MBPs.

3.3 Nature exposure

Exposure to nature is a third critical factor in immediate-return environments that fosters mindful cognitive styles.

Immediate-return environments involve minimal manipulation of natural settings, contrasting sharply with the highly-modified landscapes of urban or intensive agricultural areas common in modern delayed-return environments. This immersion in natural surroundings plays a pivotal role in shaping cognitive processes. Ecopsychology, a field examining the intricate relationship between human psychological processes and the natural environment (Gomes, 1998), provides evidence that engagement with natural settings cultivates mindful cognitive styles (Barbaro and Pickett, 2016; Ohly et al., 2016; Stevenson et al., 2018; Naor and Mayseless, 2020, 2021b; Tang et al., 2022). This nature-induced shift in cognition is characterized by a movement from "thinking, analyzing, and worrying" toward a more "meditative, sensual, and reflective" state (Snell and Simmonds, 2012, p. 331), epitomizing the transition from abstract to mindful cognitive styles.

The influence of nature exposure in fostering mindfulness has led researchers to describe it as a form of effortless attention training (Tang et al., 2022). This recognition has spurred the development of nature-based programs specifically designed to enhance attention and mindfulness (e.g., McCormack, 2018; Card and Burke, 2021; Naor and Mayseless, 2021a,b). The relationship between nature exposure and mindful cognitive styles is underpinned by strong theoretical frameworks. Attention restoration theory (ART; Basu et al., 2019) posits that modern lifestyles induce mental fatigue and diminish our capacity for voluntary attention, while natural environments help to restore our attentional resources. Complementing ART, stress reduction theory (SRT; Ulrich, 1983) proposes that nature exposure positively modulates affect and reduces stress by activating the parasympathetic nervous system and lowering autonomic arousal. Both theories are informed by the biophilia hypothesis, which suggests that our evolutionary heritage in natural environments has predisposed us to respond positively to nature (Kellert and Wilson, 1993).

Anthropological field studies provide compelling evidence for the impact of natural environments on mindful cognitive styles, particularly in enhancing attention regulation and reducing distractibility. A notable example is studies on the Himba, a semi-nomadic community inhabiting the open savannas of northern Namibia. The Himba are "significantly less distracted by task-irrelevant visual information" and possess "superior attentional control for task-relevant information" (p. 2) compared to their counterparts in modern Western and Eastern societies (de Fockert et al., 2011). The "open rural landscape... much less cluttered than the urban London environment" (de Fockert et al., 2011, p. 7) is believed to nurture this superior attentional focus and resistance to distraction. This ability to focus attention on specific objects and avoid peripheral distractions is adaptive in natural environments where salient objects are more easily distinguished from their surroundings (de Fockert et al., 2011). In contrast, urban environments, replete with visual clutter and multiple distractions, foster a cognitive style characterized by rapid, continuous scanning of the environment, including peripheral stimuli. Given this association between natural environments and increased attention-regulation capabilities, and between urban environments and reduced attention-regulation capabilities, it has been proposed that "distractibility may be an indirect consequence of urbanization" (de Fockert et al., 2011, p. 8). Supporting this hypothesis, a separate

study on the Himba revealed that even brief exposure to a small-town environment dramatically altered cognitive styles, increasing susceptibility to distractions (Caparos et al., 2012). The researchers concluded that “even relatively brief exposures exert long-lasting and incremental effects” (p. 84) on information-processing styles, underscoring the profound impact of environmental context on cognition. Because of this strong relationship between natural environments and sustained attention, it has been suggested that “presumably all other remote groups” (p. 8) living in immediate-return environments offer valuable insights into the effect of nature exposure on attention and cognition (de Fockert et al., 2011).

In summary, there is a strong interplay between nature exposure and cognitive styles. Specifically, exposure to nature is associated with an increased use of mindful cognitive styles, whereas exposure to urban (and other highly-manipulated) environments is associated with an increased use of abstract cognitive styles. These associations likely reflect cognitive adaptations to different environmental contexts. The implications for mindfulness interventions in delayed-return environments are significant. To leverage the mindfulness-promoting effects of nature exposure, we might incorporate nature-based elements into mindfulness interventions, encourage regular nature exposure, use nature imagery or sounds in indoor sessions, design urban spaces with more natural elements, and develop virtual reality nature experiences for those with limited access to natural environments.

3.4 Interconnected self-construal

The fourth factor that naturally cultivates mindful cognitive styles is a form of self-construal commonly found among communities that live in immediate-return environments. This “interconnected” form of self-construal, and its association with mindful cognitive styles, is introduced in this subsection.

Self-construal, a concept introduced by Markus and Kitayama (1991), refers to how individuals perceive and define themselves, particularly in relation to others and their environment. This concept significantly influences cognition, shaping how people view themselves and, in turn, influencing their cognitive styles and interactions with the world. Two commonly studied forms of self-construal are the independent and interdependent self-construal. The independent self-construal, prevalent in individualistic cultures, views the self as an autonomous entity distinct from its environmental context and associated with internal attributes like thoughts and emotions. In contrast, the interdependent self-construal, common in collectivistic cultures, sees the self as inherently connected to the social environment, prioritizing relationships and social roles (Markus and Kitayama, 1991). These different forms of self-construal impact cognitive processes in distinct ways. For example, the independent self-construal, with its strong prioritization of and identification with mental states, increases internal awareness of mental processes and reduces present-moment awareness (Lillard, 1998). Conversely, the interdependent self-construal fosters heightened awareness of social expectations and situational norms, leading to greater context sensitivity (Markus and Kitayama, 1991; Iyengar and Lepper, 1999; Kitayama et al., 2004).

Building on Markus and Kitayama’s (1991) proposition that self-construal is subject to substantial variation, this paper introduces a new concept in self-construal theory: the interconnected self-construal. This represents a distinct and previously unidentified form of self-perception that is broader than both the independent and interdependent forms. The interconnected self-construal incorporates connections and identification with external objects, such as the natural environment, animals, and the wider social community. This newly identified form involves both a broadening of the self to incorporate external aspects of the physical and social environments and a narrowing in terms of reduced attachment to and identification with mental states. This dual aspect distinguishes it from related concepts such as the metapersonal self (DeCicco and Stroink, 2007), allo-inclusive identity (Leary et al., 2008), quiet ego (Bauer and Wayment, 2008), and transcendent forms of the self (Cloninger et al., 1993; Levenson et al., 2005; Verhaeghen, 2019). While it shares some features with self-transcendent experiences (STEs; Yaden et al., 2017), the interconnected self-construal represents an enduring conceptualization of the self rather than a transitory experience. The interconnected self-construal promotes mindful cognitive styles as it leads to increased externally-oriented awareness (e.g., listening to sounds of leaves rustling in the wind) and reduced awareness and prioritization of internal mental states (e.g., abstract cognitive processes such as planning for the future). Empirical research supports this relationship, with both narrower self-construal (e.g., higher levels of decentering; Jankowski et al., 2022) and broader self-construal (e.g., greater connection to nature; Hanley et al., 2017; Schutte and Malouff, 2018) independently predicting higher levels of trait mindfulness. Interestingly, mindfulness practices result in a shift toward a more interconnected self-construal (Boyle, 2015).

The role of nature exposure in shaping the interconnected self-construal is particularly noteworthy. Research has shown that nature exposure leads to a broader and more inclusive self-construal, characterized by a stronger connection to and identification with nature (Schultz, 2002; Mayer et al., 2009; Pensini et al., 2016; Tang et al., 2017). It is no surprise, then, that versions of the interconnected self-construal are common among many Indigenous communities that live in immediate-return environments, characterized by perpetual immersion in largely untouched natural settings (Luhrmann et al., 2011; Colquhoun and Dockery, 2012; Dudgeon et al., 2014; Ciofalo, 2019). While there are important differences in specific forms of self-construal across communities living in immediate-return environments, many can be broadly categorized⁴ as having a self-construal that is both broad (including aspects of the environment) and narrow (less emphasis on internal mental states).

Examples include the Pintupi of Australia, who perceive their identity as deeply entwined with significant others and the natural environment, often referring to places in the first person (Myers, 1991). Pintupi “individuals see, understand, or feel themselves to be related and identified with close kin” (p. 104), and they experience

⁴ In the same way that Markus and Kitayama (1991) identified the independent and interdependent as two broad forms of self-construal while acknowledging important cultural variations within these broad forms.

this “shared identity with others as a primary feature of selfhood” (p. 104). In addition, this broader construal of the self incorporates objects that are seen in the West as being external to the person, such as aspects of the natural environment. For example, Myers described how the “Pintupi ethnopsychology seems to view an individual’s internal states as extensively connected with a web of significant others or with ‘objects’ that Western observers would describe as external to the self” (p. 108), and that “the special identification of persons with place in Pintupi thought should be considered part of this web” (p. 108). In fact, this connection to nature, and the shared identity of person with place, is so strong that “individuals come to identify places... as parts of themselves, referring to them in the first person” (p. 109). In addition to the Pintupi self-construal being broad (i.e., including aspects of the environment), it is also narrow as it does not construe mental states (e.g., thoughts and emotions) as being part of or equated with the self. For example, Myers stated that the “Pintupi structuring of the subject assumes a projection of the basis of autonomy outside the individual” (p. 125), meaning that mental states are not conceptualized or perceived to be completely under the control of the person, of the self. A study by Petchkovsky (2000) unintentionally revealed how the Pintupi self-construal does not include the idea that mental states are generated by the self. When Petchkovsky (2000) stated to Pintupi interview participants that “we Westerners usually think that we make our own thoughts” (p. 581), this typically resulted in “mirthful or incredulous responses” (p. 581) from the Pintupi interview participants, whose perspective was that thoughts are not self-generated (“from myself not”; p. 582). As discussed by Myers (1991), the Pintupi concepts for “thinking,” “understanding,” and “hearing” are expressed by the single term “kulininpa,” for which the literal translation is “to hear,” and “the organ of thought is the ear” (p. 107). This implies that the experience of thinking may be more akin to a passive rather than an active sensory experience. Petchkovsky (2000) summarized the Pintupi self-construal as being “both more exclusive and inclusive than the Western one, in terms of the locus of subjectivity, as well as in terms of its focus, what is considered of importance” (p. 593). This example exemplifies how the interconnected self-construal involves a reduced identification with internal mental states and an increased identification with the external environment and other people, compared to the independent self-construal.

Other examples include the Mbuti of Central Africa, who exhibit a self-construal deeply connected to the forest, which they view as a living entity and refer to as mother or father (Turnbull, 1965). North American Indigenous groups, who perceive the mind as existing between people rather than within individuals, emphasize the shared mind of each relationship over internal mental states (Mehl-Madrona and Pennycook, 2009). The Kanak of New Caledonia, who have few terms for mental states in their language, have a reduced focus on internal mental processes, while having a relationship between self and environment in which “each plays its own role, but each lacks distinct boundaries” (Leenhardt, 1979, p. 74). The Illongot of the Philippines, prioritize “not what goes on in the mind but rather what happens between people” (Lillard, 1998, p. 12), and, therefore, “the focus is not on a world of discrete selves containing mental worlds but on relationships” (p. 12). The Chewong of the Malay Peninsula, prioritize a concrete and externally oriented cognitive style (Howell, 1981), and place

“much less emphasis on minds” (Lillard, 1998, p. 13), having only five terms for mental processes. Each of these examples show how aspects of the interconnected self-construal are experienced across various Indigenous communities living in immediate-return environments.

Fascinatingly, events that cause a cultural shift in self-construal can also lead to changes in cognitive styles over a relatively short period of time. For example, the Temiar, an Indigenous group living on the fringes of the rainforest in northern Malaysia, traditionally have a self-construal that perceives the forest and natural surroundings as a core part of their identity (Benjamin, 2014) and prioritize a concrete and externally-focused cognitive style (Thong et al., 2023). Over the past two decades, some Temiar have converted to Christianity, which has led to a more independent form of self-construal and an associated change from a concrete and present-oriented cognitive style (i.e., mindful cognitive style) to a more abstract and future-oriented cognitive style (Thong et al., 2023). Similar patterns of change have been found in other Indigenous communities that have converted to Christianity (e.g., the Urapmin of Papua New Guinea; Robbins, 2004). Thong et al. (2023) conclude:

In sum, conversion impacts on self-construal (from collective to individual), perceptions (perceptual-concrete to conceptual-abstract), and emotional processing (from experience-near to experience-distant [more intellectualized emotional processing]; from external to internal focus) of the converts. (Thong et al., 2023, p. 8)

These changes described by Thong et al. (2023) provide strong support for the relationship between the interconnected self-construal and mindful cognitive styles, and between the independent self-construal and abstract cognitive styles.

While the interconnected self-construal appears to emerge organically in immediate-return environments, the independent self-construal, dominant in modern Western societies, emerged from specific historical events, such as: the transition to agriculture (Berry, 1967; Talhelm et al., 2014), the emphasis on debate and personal autonomy in ancient Greek culture (Hamilton, 1973), the development of Christianity (and in particular the doctrine of inner assent, which is the concept that inner thoughts and beliefs are of primary importance compared to outward behavior; Dumont, 1982; Keane, 2007; Luhrmann, 2021), the rise of industrial capitalism (Weber and Kalberg, 2013), and the influence of Cartesian philosophy, encapsulated by the phrase “cogito ergo sum” or “I think; therefore, I am” (Wilkes, 1988). Intriguingly, the independent form of self-construal, which is highly associated with abstract cognitive styles, has been described as peculiar, rare, and containing logical inconsistencies. For example, the prioritization and primary identification with mental states—a core feature of the contemporary independent self-construal—is not shared in other modern or historic cultures (Lillard, 1998). For this reason, the modern independent self-construal has been described as “culturally peculiar” (Luhrmann, 2021), “an eccentricity among cultures,” and “far from expressing the common experience of humanity” (Morris, 1987, p. 2). Dumont (1982) states that this form of self-construal is “an exceptional phenomenon” (p. 1). In addition to being historically and cross-culturally unique, the modern

independent self-construal contains logical inconsistencies; for example, conceiving of the self as being equated with the mind and being located “in” and often identified “with” the brain, yet simultaneously conceiving of the mind as distinct from the body (Lillard, 1998). Prominent Western scientists like William James and Albert Einstein have highlighted the limitations of this self-construal. James questioned the notion of an autonomous self that generates thoughts, while Einstein viewed the sense of separation inherent in the independent self-construal as an “optical delusion of consciousness” (James, 1890; Sullivan, 1972).

In summary, this section reviewed the profound influence of environmental factors on the development of self-construal, which in turn shapes cognitive styles. Immediate-return environments, characterized by close connections to nature and community, foster an interconnected self-construal associated with mindful cognitive styles. In contrast, delayed-return environments, particularly modern individualistic Western societies, cultivate an independent self-construal linked to more abstract cognitive styles. This understanding has far-reaching implications for our conceptualization of mindfulness and mental wellbeing. The shift from independent to interconnected forms of self-construal often resulting from mindfulness practices may, in fact, represent a return to a more natural mode of cognition and experience common in immediate-return environments. This possibility invites us to reconsider the foundations and generalizability of our modern cognitive styles and self-perceptions. Moreover, it presents intriguing opportunities for interventions and educational programs. Nature-based initiatives could potentially enhance both nature-connectedness and mindfulness simultaneously, facilitating shifts toward a more interconnected self-construal. This approach might offer a more holistic and culturally inclusive path to mental wellbeing, one that acknowledges our deep connection to the natural world. Additionally, this perspective might facilitate a redesign of our social and physical environments to better support the cultivation of interconnected self-construal and mindful cognitive styles, even within the constraints of modern, delayed-return environments.

4 Summary and discussion

This paper introduces the environmental model of mindfulness, a novel perspective which frames mindfulness as an adaptive set of cognitive styles shaped by specific socioecological contexts. By integrating insights from cognitive psychology, anthropology, and environmental studies, this model identifies four key factors of immediate-return environments that naturally cultivate mindful cognitive styles: immediate feedback, observational learning, nature exposure, and interconnected self-construal. This model extends existing perspectives, which conceptualize mindfulness as a cultivated trait or ethical practice, by highlighting the inherent connection with environmental contexts.

The environmental model offers several groundbreaking contributions to the field of mindfulness research. Firstly, it bridges the gap between the Western medical model and the Buddhist ethical model by situating mindfulness within a broader ecological context. This integration provides a unifying framework that acknowledges the cognitive, environmental, and cultural aspects of mindfulness. Secondly, it highlights the natural occurrence

of mindfulness in immediate-return environments, offering an additional perspective on the origins and function of mindful cognitive styles. This perspective calls into question established frameworks in psychology, such as Killingsworth and Gilbert’s (2010) conclusion that “a human mind is a wandering mind, and a wandering mind is an unhappy mind” (p. 132). The environmental model suggests that mind-wandering may not be an inherent characteristic of human cognition, but rather a product of specific environmental contexts. Thirdly, the model introduces the concept of interconnected self-construal, a form of self-perception that both broadens identification with the external environment and narrows attachment to internal mental states. This concept finds intriguing parallels in ancient traditions. For instance, the Taoist text *Zhuangzi* suggests that in the distant past, humans saw themselves as part of a whole, without division from nature (Eno, 2019). Similarly, Zen master Dogen’s teachings emphasize the process of “forgetting the self” to become “verified by all things” (Okumura, 2010), reflecting a shift from self-identification with mental states to a broader connection with the environment.

These parallels suggest that the historical development of mindfulness practices could be seen as an attempt to rediscover a more “natural” state of cognition, transforming a “delayed-return mind” into an “immediate-return mind.” This perspective aligns with both Einstein’s and Bodhi’s description of the sense of a separate self—a central feature of delayed-return minds—as a “delusion” and “false belief,” respectively (Sullivan, 1972; Bodhi, 2016). It suggests that the sense of a separate self, highly associated with mind-wandering and abstract cognitive styles, may be a feature of delayed-return environments rather than a universal human experience (Turnbull, 1965; Myers, 1991; Lillard, 1997, 1998; Petchkovsky, 2000; Mehl-Madrona and Pennycook, 2009). This insight not only enriches our understanding of mindfulness, it also highlights potential overgeneralizations in our fundamental assumptions about human cognition and selfhood across cultures and throughout history.

The implications of the environmental model are far-reaching and potentially transformative. From a research perspective, the model identifies a need for more ecologically valid methods that consider the complex interplay between environment and cognition. For clinical applications, it suggests new possibilities for designing mindfulness interventions that incorporate elements of immediate-return environments. For instance, nature-based therapies, immediate feedback mechanisms, and observational learning techniques could be integrated into existing mindfulness-based interventions to enhance their effectiveness. The environmental model also invites a critical review of the impact that modern delayed-return environments have on cognitive processes. For example, the prevalence of abstract thinking, future-oriented planning, and independent self-construal in modern Western contexts may be viewed not as inherent human tendencies, but as specific adaptations to delayed-return environments. This perspective extends our understanding of human cognition and wellbeing, suggesting that our modern environments and societal structures may limit the use of mindful cognitive styles.

It is important to acknowledge several limitations of the current model. While four key environmental factors have been identified, this list is not exhaustive, and other factors may play significant roles in fostering mindful cognitive styles in immediate-return

environments. The reliance on anthropological studies, while providing rich examples, may limit generalizability. Additionally, the concept of interconnected self-construal, though promising, requires further empirical validation and refinement.

Future research directions are numerous and promising. Longitudinal studies examining the impact of environmental changes on cognitive styles could provide valuable insights into the malleability of mindfulness. Cross-cultural studies comparing mindfulness levels and associated cognitive styles across a spectrum of environments and cultures, from immediate-return to highly industrialized, could further reveal the relationship between environmental factors and mindfulness. Experimental studies manipulating environmental factors in controlled settings could help isolate their individual and combined effects on mindful cognitive styles. For instance, research could explore the dose–response relationship between nature exposure and mindfulness, or investigate the impact of different feedback mechanisms on present-moment awareness. The development and validation of measures for the interconnected form of self-construal represent another crucial area for future work.

In the realm of applied research, studies could examine the effectiveness of environmentally informed mindfulness interventions. For example, nature-based mindfulness programs or interventions incorporating elements of observational learning could be compared with traditional MBPs. Such research could pave the way for more effective, culturally sensitive, and ecologically grounded approaches to promoting wellbeing. Interdisciplinary collaborations between mindfulness researchers, anthropologists, ecopsychologists, and cognitive scientists could yield rich insights into the complex interplay between environment, cognition, and wellbeing. These collaborations could lead to innovative methodologies for studying mindfulness in diverse contexts and potentially uncover additional environmental factors that influence cognitive styles.

In conclusion, the environmental model of mindfulness extends upon existing literature and offers a new perspective on how we conceptualize, study, and cultivate mindfulness. Recognizing that mindfulness can present as an adaptive response to specific environmental conditions opens up new avenues for understanding human cognition and promoting wellbeing in our increasingly complex world. This model provides a timely reminder of our deep interconnectedness with our environment, encouraging us to reexamine our relationship with our surroundings. As we face growing challenges related to mental health, environmental degradation, and societal fragmentation, the environmental model offers a powerful lens through which to address some of these issues. It invites us to create contexts that naturally foster mindfulness, not just as an individual practice, but as a natural and collective way of being. The environmental model of mindfulness thus stands as a call to action—for researchers, clinicians, policymakers, and individuals alike—to reconsider our

fundamental assumptions about human cognition and to design our world in ways that support our innate capacity for mindful awareness and the experience of interconnection.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

JM: Writing – review & editing, Writing – original draft, Conceptualization.

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Conflict of interest

The author discloses that they are the founder and sole proprietor of Mindful Origins, a Limited Liability Company (LLC). Mindful Origins conducts research, develops educational content, and provides training sessions on topics related to mindfulness, nature-based activities, and equine-assisted services to support public, private, and non-profit entities.

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