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Mindfulness, Meditation, and Lucid Dreaming

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Abstract

Mindfulness as a personality trait or a meditative exercise requires a person to be aware of their own thoughts and surroundings, attending to them in a conscious, intentional way. Lucid dreaming is similar in that it is a type of dreaming in which dreamers are aware and conscious of the fact that they are dreaming. Both appear to involve metacognition and awareness, or "awareness of awareness" in which the subject is aware and consciously attending to present experiences. Despite evidence to support the continuity hypothesis of dreaming (that posits a connection and continuation of sleeping and waking cognitions), little research has explored a relationship between lucid dreaming and waking mindfulness. The purpose of the present study was to clarify the relationship between mindfulness, lucid dreaming, and meditation experience, as engaging in meditative exercises has been closely linked to both mindfulness and lucid dreaming. A sample of undergraduate students and meditators completed questionnaires related to mindfulness, lucid dreaming frequency, and meditation practices. Surprisingly, lucid dreaming was not associated with narrowband mindfulness concepts like presence, acceptance, and awareness. Intercorrelations and multiple regression analyses indicated that lucid dreaming frequency was predicted only by experiences of Fantasy and Mindful Transcendence. Lucid dreaming frequency was also unrelated to meditation practice frequency. Possible personality implications are discussed to explain the present findings.

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Introduction

In the most general sense, the terms meditation and mindfulness are used interchangeably. "Mindfulness [or 'meditation'] is awareness of the present moment. Mindfulness [or 'meditation'] is sustained simple focus with minimal judgment, tension/effort, and thought" (Smith, 2019, p. 1). There are many definitions of meditation and mindfulness, and sometimes they conflict. This is the most general definition. Other definitions and meanings of these terms will be explicated later in this dissertation. Lucid dreaming refers to being aware that one is in a dream, and possibly being able to control aspects of the dream. These concepts of meditation, mindfulness, and lucid dreaming have seldom been explored together as similar types of phenomena.

Mindfulness and lucid dreaming (LD) are variants of secondary consciousness experiences. According to Hobson (2009), secondary consciousness is a type of self-reflective awareness, or metacognition, in which the person is aware of what they are doing or thinking. This is considered a type of higher order thinking that requires greater cognitive ability than primary consciousness, which refers to the simple perception and emotion exhibited by most mammals. States of consciousness can be broken down into these two categories across different states of arousal, namely sleep and waking. Generally speaking, several studies examining waking and sleeping cognitions have found much in common across states (Kahan & LaBerge, 1996, 2011; Kahan, LaBerge, Levitan, & Zimbardo, 1997; Wolman & Kozmová, 2007).

Primary and secondary consciousness experiences occur during both waking and sleeping cognition. For instance, primary consciousness experiences during wakeful cognition include mind-wandering (e.g., unintentionally shifting attention from a presentation to what is for dinner) and automatic behaviors (e.g., driving somewhere routinely with little memory of the drive),

whereas in sleep, these experiences consist of dreams that the dreamer is unable to influence. In wakeful awareness, one may display secondary consciousness spontaneously as self-awareness. Secondary consciousness is also associated with mindfulness and certain types of meditative practices. In sleep, lucid dreaming is considered a secondary consciousness experience because the dreamer is aware of the fact that he or she is dreaming and can exert some control over the experience. Research has demonstrated the health benefits of practicing mindfulness exercises as a means of developing mindfulness states (Brown, Marquis, & Guiffrida, 2013). Specifically, mindfulness interventions have resulted in improvements in mental well-being and a reduction in mind-wandering and rumination (Evans & Segerstrom, 2010; Keng, Smoski, & Robins, 2011; Keune, Bostanov, Kotchoubey, & Hautzinger, 2012; Mrazek, Franklin, Phillips, Baird, & Schooler, 2013). Lucid dreaming has also demonstrated some benefits as a way to facilitate better problem-solving and emotion regulation (Doll, Gittler, & Holzinger, 2009). It has also been applied in several pilot studies as a treatment for nightmare reduction in PTSD populations (Spoormaker, 2006).

One common way to engage in mindfulness is through meditative exercises, broadly defined as attentional training where one's focus is maintained in a particular way without fixating on any particular moment of experience (Chambers, Gullone, & Allen, 2009). That is, meditative exercises involve sustaining simple focus with minimal judgment, tension/effort, and thought (Smith, 2019). Some exercises are more focused, whereas others, such as pure mindfulness, are more open. Some, like yoga, involve movement, postures, and stretches. Meditative exercises claim to improve dispositional mindfulness, or the propensity to experience mindfulness over time (Brown & Ryan, 2003). Interestingly, meditative practices also have connections to lucid dreaming (Gackenbach & Bosveld, 1990; Hunt, 1989; Hunt & Ogilvie,

1988). Lucid dreaming is far less studied but could provide similar clinical benefits to those of mindfulness. Stumbrys (2011) hypothesized an association between meditation, mindfulness, and lucid dreaming, and found some preliminary evidence thereof (Stumbrys, Erlacher, & Malinowski, 2015), but the causes of such a relationship remain relatively unknown.

The purpose of this dissertation is to determine the relationship between mindfulness, lucid dreaming, and meditation experience. I start by defining mindfulness using historical and current conceptualizations. I provide a working definition for the purposes of this dissertation and I discuss and define each of Smith's (2019) Relaxation/Meditation/Mindfulness (RMM) states. Next, I review the history and current conceptualizations of lucid dreaming, including a working definition. I then review the connections between lucid dreaming and meditation practice history. I also discuss the relationships between lucid dreaming, mindfulness and meditation. Finally, I discuss the rationale for the present study and its clinical relevance. I hypothesized that mindfulness and meditation would both predict lucid dreaming frequency, and that meditation experience together with mindfulness would predict a greater portion of the variance than either variable alone. I also hypothesized that a broadband assessment of mindfulness would predict more of the variance in lucid dreaming frequency than would a narrowband measure.

Mindfulness and Meditation

Mindfulness has been defined in many ways. One popular example is Kabat-Zinn's definition of "paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally" (1994, p. 4). Mindfulness has grown in popularity in psychology over the past 30 years (Bishop et al., 2004). Along with this increase in popularity, the word has been applied to an action, state, or trait (Chambers, Gullone, & Allen, 2009). Mindfulness as an action

typically refers to engagement in any one type of meditation or deploying meditation in other activities, such as mindful walking or mindfully making tea, with careful attention and focus on the present moment and one's experiences. State mindfulness refers to the direct experience of mindfulness, in which one feels aware of the surroundings, thoughts, and feelings being experienced in the moment (Kabat-Zinn, 1994). Thus, mindfulness can describe the action of engaging in this practice or it can describe the goal of the practice as a type of state. The word "mindfulness" can also refer to a disposition or relatively enduring personality trait in which one tends to behave mindfully and regularly experience mindfulness states. Individuals who demonstrate high degrees of dispositional mindfulness by definition tend to react to situations nonjudgmentally, with greater focus, acceptance, and self-awareness.

More recently, Lutz, Jha, Dunne, and Saron (2015) conceptualized mindfulness exercises, activities, and processes in terms of a multidimensional phenomenological matrix. This framework characterizes meditative practices using three primary, dynamic dimensions of meta-awareness, object orientation, and dereification, and four secondary qualities of aperture, clarity, stability, and effort. In addition to these characteristics, the authors assume mindfulness to have four features of physical posture, nonaversive affect, an axiological framework, and task-set maintenance. To summarize, separate conceptualizations of mindfulness as a state of being, a personality trait, and a meditative practice are interconnected and phenomenologically and neurocognitively related and can thus be understood together within the same framework. Further elaboration is beyond the scope of this dissertation. Lutz et al. (2015) state that the scientific understanding of mindfulness is hindered by the separation of these ideas and simplification of the word into one construct. Mindfulness is phenomenologically

multidimensional and should be investigated as such. Even so, these conceptualizations of mindfulness do not utilize practical language accessible to the average practitioner.

Given the disparate conceptualizations of mindfulness, the working definition for this dissertation is, "awareness of the present moment as it is. Mindfulness is sustained simple focus with minimal distracting judgment, tension/effort, and thought," (Smith, 2017; 2019, p. 1). Mindful focus can be restricted like a microscopic lens or it can be broad and open, like a wide-angle lens (Lutz, et al., 2015). When one adopts this mindful perspective, one can observe the objective realities of the universe without including distractions of self-centered needs and expectations, judgments, distortions, and prejudices. Mindfulness is also quiet, in that a person seeks to minimize unnecessary judgment, tension and effort, and unnecessary thought. Mindfulness requires a certain degree of thoughtful involvement and tension, but ultimately one is aiming to reduce unnecessary and excessive tension and thought. This dissertation adopts this description of mindfulness. But first, I review historical and Western conceptualizations of mindfulness.

Historical Development of Mindfulness

Mindfulness as a practice originated in Buddhism around 2,500 years ago as a path to the cessation of suffering and the achievement of enlightenment (Brown, Creswell, & Ryan, 2015). Buddhism is centered around the teaching of four noble truths and the Eightfold Path. One limb of the Buddhist path is mindfulness (Monteiro, Musten, & Compson, 2015). The other limbs on the eightfold path include right speech, right action, right livelihood, right effort, right concentration, right view, and right intention ("Eightfold Path," n.d.). The Noble Eightfold path is the central focus of almost all Buddhist teachings in some form or another and is believed by Buddhists to lead to the development of morality, wisdom, and the cessation of suffering

(Kudesia & Nyima, 2015). Thus, mindfulness was originally taught as a type of behavioral domain through which one can alleviate suffering.

Mindfulness exercises have been used for millennia and in several ways within the Buddhist tradition. Mindfulness has been understood as a cognitive skill underlying meditation, the first stage of meditation where meta-awareness is developed, and as the ability to remember one's true purpose in life (Kudesia & Nyima, 2015). Predominantly, however, mindfulness has been conceptualized as a type of training to gradually reduce the reification of cognitive processes that produces subject–object duality (Kudesia & Nyima, 2015). Subject-object duality in thinking occurs when individuals tend to see themselves as discrete entities separate from the rest of the world. Reification refers to the propensity to treat thoughts as objective realities. The Buddhist tradition teaches that reifying thoughts encourages a false subject-object duality. The process of reducing the reification of cognitive processes, then, leads to enlightenment, which is the elimination of suffering that results from the realization of non-referential awareness, or awareness that is not tied to notions of a discrete self. Achieving this end state is the ultimate goal of Buddhism.

First and Second-Generation Mindfulness

Within the last 45 years, Western psychology has rapidly adopted mindfulness in secular treatments (Thompson, Arnkoff, & Glass, 2011). Van Gorden, Shonin, and Griffiths (2015) identified the progression of mindfulness by outlining first and second generations of mindfulness practices. First-generation mindfulness practices include all mindfulness practices that aim to develop focused and nonjudgmental attention. It does not consider other psychological or spiritual principles that were traditionally associated with Buddhism. First-

generation mindfulness strives to disconnect from Buddhist ideology to apply the practice secularly.

Recently, some have questioned the isolation of mindfulness techniques from their Buddhist context. In doing so, it may be that the fundamental concept of mindfulness is changed and the driving forces behind its effectiveness are clouded (Monteiro, Musten, & Compson, 2015; Van Gorden, Shonin, Griffiths, & Singh, 2014). The second generation of mindfulness seeks to address this problem by reincorporating key elements of Buddhist psychology, including ethical principles derived from the Eightfold Noble Path, as well as spiritual experiences and increased understanding of the impermanence of objects. By doing so, one is fully able to practice mindfulness as it was originally intended, and core aspects of the experience are not denied to the practitioner. This, it is claimed, increases the efficacy of the practice.

Third-Generation Mindfulness

Smith (2017) expanded on previous conceptualizations of mindfulness by recognizing the connection and reciprocal relationship between mindfulness and relaxation. Relaxation enables the practitioner to remain focused and attentive, reduces the amount of effort needed, and enables the practitioner to minimize judgment of the experience (Smith, 2017). At the same time, mindfulness enables the practitioner to feel at ease and enter a state of relaxation. Thus, mindfulness facilitates relaxation, and relaxation facilitates mindfulness.

Smith (2019) defines "third-generation mindfulness" as:

1) A dynamic transactional process, rather than a static trait or state.
2) Not Buddhist.
3) Not wedded to any religion.

4) Based on the brain-based skill of quiet, sustained simple focus. This core attentional act serves as a basic exercise and a template for understanding all levels of mindful practice, experience, insight, expression, and application.
5) Based on acceptance that impermanence and change are central to the "way things are." However, this is not a final statement or end truth. It is up to the mindful meditator to discover what this change is and where it is going. As such, third-generation mindfulness is open to the notion that direction and purpose can be central to the experience of mindfulness. Unlike first or second-generation approaches, purpose can be a feature of "the way things are," something to be discovered as one puts aside self-referential thinking. Not a self-centered or dogma-driven construct imposed on oneself and the world.
6) Informed by the universal natural language of relaxation and mindfulness, words used by actual everyday practitioners of diverse traditions to describe their experiences. This is in contrast to the esoteric or scientific terminology used by experts. The universal natural language of mindfulness implies that there may be many present-centered worlds of mindfulness, supported by many philosophies.
7) Inclusive of a wide spectrum of techniques, strategies, and perspectives. Key to this inclusiveness is the recognition that all approaches to relaxation have elements of mindful focus and can serve as preparations or expressions of mindfulness. Indeed, many approaches to active stress management have elements of mindful focus.
8) Supportive of active, creative, and authentic engagement in a challenging world (Smith, 2019, pp. 4-5).

Focused Attention and Open Monitoring Meditation.

Lutz et al. (2015) differentiate meditation into two broad categories of Focused Attention (FA) and Open Monitoring (OM) meditation. FA directs attention and focus onto a single object or phenomenon to the exclusion of extraneous stimuli. Smith (2017; 2019) differentiates FA meditation further into somatic meditation and cognitive meditation. Somatic meditation (FAs) focuses on the body, such as breathing or noticing physical sensations, whereas cognitive meditation (FAc) emphasizes a mental focus such as a mantra or mental image. FAc is similar to a third category of meditation proposed by Travis and Shear (2010), labeled Automatic Self-Transcending meditation. Here the practitioner's mantra or mental image develops and exists seemingly with the practitioner as a passive observer, without much active influence. The mantra that one repeats is not something deliberately done but rather a type of "guide" (Smith, 2017; in press). OM meditation also focuses on the cultivation of meta-awareness but is more focused on observing whatever phenomena pass through awareness without becoming overly involved in any one thought or experience (Lutz et al., 2015). When the practitioner notices getting caught up in a thought or idea, the practitioner gently and nonjudgmentally returns attention to the open monitoring of experiences equally.

According to Smith (2019), FA meditation is "classical meditation" and OM meditation is "classical mindfulness" as taught in first and second-generation mindfulness programs. Smith (2019) states:

> "It is important to note that this differentiation is concrete and specific… This confusion [in the literature] can be resolved by differentiating general from specific definitions of both meditation and mindfulness. At the general level, meditation and mindfulness mean the same thing and can be (and have been) interchangeable. I define both as awareness of

> the present moment; sustained simple focus with minimal distracting judgment, tension /effort, and thought. Such awareness is meditative, and it is mindful. Whether one's target focus is a mantra, a candle flame, a body sensation, the flow of breath (FA) or the flow of stimuli in the present moment (OM), one is still sustaining awareness. The focus is still simple. A mantra, a candle, a body sensation, the flow of breath, and all present stimuli, are all "present moment" targets. For all, one displays "minimal judgment, tension/effort, and thought" (p. 1).

Some practitioners may engage in only one type of meditation, whereas others may practice a mixed technique (Smith, 2017). It is important to distinguish between these types of meditative experiences, as they may have different experiential effects for the practitioner.

RMM States

Third-generation mindfulness uses the language of everyday practitioners and avoids the technical and religiously based language of first and second-generation mindfulness practices. Within Smith's (2019) conceptualization of mindfulness, there are "5+1" dynamic levels of experience: Mindful Basic Relaxation, Basic Mindfulness: Focus, Basic Mindfulness: Quiet, Mindful Awakening, Mindful Deepening, and Mindful Transformation and Transcendence, moderated by Mindful Positive Emotion. Within each level, there are specific RMM (Relaxation/Meditation/Mindfulness) states that are considered conceptually different expressions of the level of experience to which they belong. See Table 1 for details.

Table 1

RMM States and the 5+1 Levels of Mindfulness and Relaxation

Level of Mindfulness and Relaxation	RMM State (RMM State #)
1. Mindful Basic Relaxation	− Far Away (1) − Physically Relaxed (2) − At Ease, At Peace (3) − Refreshed (4)
2. Mindful Quiet Focus	− Focused, Absorbed (7) − Centered, Grounded (8) − Quiet (9) − Unbothered (10) − Easy, Effortless (11)
3. Mindful Awakening	− Observer (12) − Clear, Awake, Aware (13) − Interested, Curious, Fascinated (14) − Beautiful (15)
4. Mindful Deepening	− Going Deeper (16) − Spaciousness, Expansiveness (17) − Sense of Something Greater (18) − Meaning, Purpose, Direction (19)
5. Mindful Transformation /Transcendence	− Reverent, Prayerful (20) − Awe/Wonder, Deep Mystery (21) − Spiritual, Mystical (22)
+1 Mindful Transcendent Positive Emotion	− Happy, Optimistic, Trusting (23) − Loving, Caring (24) − Thankful (25)
Exploratory Dimensions: 1. Pleasant Mind Wandering 2. Fantasy Daydreaming	 − Pleasant Mind Wandering (5) − Fantasy, Daydreaming (6)

Within Smith's (2019) Level 1 of "Mindful Basic Relaxation," there are six specific RMM states. All involve reductions in aversive stimulation, but are experienced as unique,

differentiated types of basic relaxation. RMM 1 is, "Far Away." The practitioner feels detached from the stressors of daily life and experiences a sense of being removed from cares and concerns. RMM 2 is "Physically Relaxed," which describes the experience of reduced muscle tension and increased breathing relaxation. RMM 3, "At Ease/At Peace," refers to the release of mental tension or distress. RMM 4, "Refreshed," occurs when the practitioner feels reenergized through relaxation.

Also within Level 1 are RMM 5, "Pleasant Mind Wandering" and RMM 6 "Fantasy and Daydreaming." These states may be more likely to develop from the reduction of tension, fatigue, and stressful stimulation. "Pleasant Mind Wandering," is a phenomenon that mindfulness researchers and practitioners often neglect. This RMM state refers to the act of letting go and relaxing into undirected fantasy and pleasant random mind wandering. This may seem counterintuitive to the definition of mindfulness, but it acknowledges one aspect of relaxation that is inextricably linked to mindfulness. RMM 6, "Fantasy, Daydreaming," refers to when daydreaming is developed as a more cohesive, narrative version of Pleasant Mind Wandering. This type of Basic Relaxation is often reported as a distraction to mindfulness but is a state of Basic Relaxation, nonetheless.

Smith (2019) defined Level 2 of mindfulness and relaxation as "Mindful Quiet Focus," which is the level that one typically associates with the word *mindfulness*. The five RMM states within this level of mindfulness include "Focused, Absorbed," "Centered, Grounded," "Quiet," "Unbothered," and "Easy, Effortless." RMM7, Focus/Absorption, refers to the experience of directed attention onto a stimulus which may result in feeling absorbed in focus. Centered, Grounded (RMM 8) occurs when one's experience of focus and attention feels stable and comfortable. Quiet (RMM 9) describes the feeling of inner silence and calm. It is not feelings of

serenity or numbness, but rather an absence of mental noise and judgment whilst focusing on a stimulus. Unbothered (RMM 10) describes the accepting, nonjudgmental attitude that has been referred to as dereification in previous conceptualizations of mindfulness. It involves reduced judgment of negative thoughts or feelings, if they are present. Easy, Effortless (RMM 11) describes the fact that being mindful does not feel challenging and feels as the name suggests: easy and effortless.

Level 3, "Mindful Awakening," refers to a group of experiences that may come up after the brain-based skill of sustained, easy focus is achieved (Smith, 2019). It is in this level of mindfulness where the practitioner begins to adopt a more dynamic, other-directed orientation. The level is composed of four RMM states, including "Observer," "Clear, Awake, Aware," "Interested, Curious, Fascinated," and "Beautiful." The observer (RMM 12) reflects the experience of being a neutral and objective witness to whatever thoughts or emotions that are surfacing without interrupting. Clear, Awake, Aware (RMM 13) refers to a sense of greater clarity and understanding that comes with experiencing things as they really are, without subjective perception. RMM 14, Interested, Curious, Fascinated, is when the practitioner senses a deeper reality or meaning behind an experience (e.g., meaning of the breath), and experiences a curiosity about what that deeper reality may be. The RMM 15, Beautiful, is simply when the world or aspects of it seem harmonious and beautiful.

Level four, "Mindful Deepening," includes another feature of mindfulness in which the practitioner's focal target changes and evolves from what was originally a static state (Smith, 2017). Within this level are the RMM states of "Going Deeper," "Spaciousness/ Expansiveness," "Sense of Something Greater," and "Meaning, Purpose, Direction." For RMM 16, "Going Deeper," the practitioner has a sense that their practice is changing and that an

"opening up" is occurring in which revelations may present themselves. Spaciousness/ Expansiveness (RMM 17) refers to the feeling of expanding. RMM 18, Sense of Something Greater, is the feeling of the presence of something greater than oneself (e.g., higher power, love, God, interconnectedness). Meaning, Purpose, Direction (RMM 19) refers to the experience of these feelings.

The final level of mindfulness, "Mindful Transformation/Transcendence," reflects an awareness of the greater world beyond one's individual identity and can be conceived as a "living relationship" to the world outside of self-referential concern (Smith, 2017). The three RMM states within this level include, "Reverent, Prayerful," "Awe/Wonder, Deep Mystery," and "Spiritual, Mystical." In RMM 20, Reverent, Prayerful, the practitioner is expressing feelings outward of reverence and prayerfulness as an emotional response to the sense of something greater. Awe/Wonder, Deep Mystery (RMM 21) refers to the feelings of awe and wonder at this transcendental awareness that may leave the practitioner speechless. In this state, the practitioner is temporarily freed from the constraints of verbal, analytical language used to describe phenomena and is simply experiencing the sense of awe and wonder at something the practitioner may not fully understand. The RMM 22, Spiritual/Mystical, refers to the experience of a profound spiritual awakening, insight, or feeling of being "at one" with the universe.

Also included in the 5+1 Levels, "Mindful Transcendent Positive Emotion" includes 3 RMM states that do not make up a separate level but can instead emerge at any time. These refer to emotions commonly felt throughout all levels of the RMM experiences (Smith, 2017). These RMM states are "Happy, Optimistic, Trusting," "Loving, Caring," and "Thankful."

Smith (2017) posits six dimensions on which the five levels differ. First, lower-level states are more commonly seen in beginning practice, whereas higher-level states are associated

with longer periods of practice. This is not to say that first-time practitioners are incapable of achieving the 5+1 level of experience, but that they are more likely to spend a greater period of their mindfulness practice in the earlier levels. Second, as one progresses through the levels of mindfulness, other-referential thinking increases and self-referential thinking decreases. In other words, one tends to think less egocentrically and more about the concerns and needs of others as one progresses up through the levels of mindfulness. This is consistent with the Buddhist goals of mindfulness as a means of transcending personal realities and coming to see reality as it is, without personal and subjective distortion, along with a decentered way of thinking. Third, higher levels of mindfulness are increasingly abstract, open, and encompassing, with a broader range of application. Fourth, higher-level RMM states are more likely to be susceptible to change and evolution. Fifth, higher-level states are more likely to be transactional, incorporating a broader range of RMM states. The sixth and final dimensions posit that higher-level states result in a sense of something larger or greater than oneself.

The RMM Tracker Approach

The RMM Tracker is a 25-item self-report questionnaire developed to assess the 5+1 dimensions of Smith's model of mindfulness and relaxation. Other measures of mindfulness are narrowband measures that assess for facets of awareness and acceptance. This model is a broadband measure that is designed to measure the full spectrum of potential mindfulness and relaxation states associated with mindfulness practices. It measures awareness, acceptance, and the four other domains of RMM.

Smith developed the RMM Tracker by formulating a list of approximately 200 words practitioners use to describe psychological states associated with meditative practices. These were taken from instructional materials of a wide variety of relaxation and mindfulness

exercises. Factor analyses then determined how these words grouped to form the core features of relaxation and mindfulness found in the natural language of mindfulness- and relation-related practitioners (Smith, 2017). Analyses distilled 25 Relaxation and Mindfulness States, or RMM States, from this dictionary and are summarized in Table 1.

Benefits of Mindfulness

Studies examining mindfulness as one unified construct have found some interesting and promising results. Davis and Hayes (2012) outlined the major benefits of mindfulness and meditation, including affective skills like emotion regulation, decreased reactivity, and increased response flexibility. Other benefits include enhanced processing speed, decreased task effort, and enhanced self-insight, morality, intuition, and fear management (David & Hayes, 2012). Mindfulness exercises have also been linked to several health benefits like improved immune functioning, reduced sensory pain, and reduced distress in interpersonal conflict (David & Hayes, 2012; Grossman, Niemann, Schmidt, & Walach, 2004).

Dispositional mindfulness, or the more enduring personality trait of mindfulness, has been linked to several health benefits. One recent review found three relationships between trait mindfulness and psychological health: (a) that dispositional mindfulness is inversely correlated to psychopathological symptoms like depression and anxiety, (b) mindfulness is associated with greater use of adaptive cognitive processes and reduced rumination and pain catastrophizing, and (c) individuals with greater trait mindfulness tend to exhibit better emotional processing and regulation (Tomlinson, Yousaf, Vittersø, & Jones, 2017).

Lucid Dreaming

A lucid dream is defined as a dream in which one becomes aware that one is dreaming while the dream is ongoing (LaBerge, 1985). This simple definition has been used since the

legitimacy of lucid dreaming as a discrete phenomenon was established. Some argue that the dreamer must be able to control parts of the dream in order for it to be considered a lucid dream. Others argue that in a lucid dream state, the dreamer can often control or manipulate what is happening in the dream and remember aspects of their waking life, but this is not required for a lucid dream to occur (Dresler et al., 2012). For the purposes of this study, the broader definition where any dream in which the dreamer is aware of the dream, as either a passive observer or active participant, was used.

Phenomenology

Lucid dreams tend to exhibit continuity and similarities to regular dreams and to waking life (Gackenbach, 1988). However, some notable differences exist between dreams that are lucid and those that are not. Lucid dreams tend to be more cognitive, more emotional, and more perceptual than regular dreams (Gackenbach & Schillig, 1983). That is, lucid dreamers report greater cognitive control and greater perceptual awareness in a lucid dream than in a dream that is not lucid. Lucid dreamers also report having a more active role in their dreams, in which they plan to accomplish different tasks and attempt to complete goal-directed actions. However, dreamers may not always succeed in accomplishing their goals due to waking up or other hindrances within the dream environment (Stumbrys, Erlacher, Johnson, & Schredl, 2014).

Lucid dreams may be experienced as simultaneously joyous and fearful due to the dreamer's realization that they are dreaming (Shulman & Stroumsa, 1999). Some researchers found a general intensification of emotion in lucid dreams (Gackenbach, 1988; Hunt, 1989), whereas others like Thomas, Pollak, and Kahan (2015) found that lucid dreams tend to have a greater prevalence of only positive affect. Furthermore, lucid dreams are commonly associated with more unordinary sensations like out-of-body experiences, flying, and physically impossible

events (Barrett, 1991; Blackmore, 1982; Irwin, 1985; Levitan, LaBerge, DeGracia, & Zimbardo, 1999). Thus, while lucid dreams tend to have more aspects of waking life (i.e., greater volitional control, goal-directed action) than regular dreams, they also seem to exhibit less congruency in other ways (Schredl, 2010).

History of Research on Lucid Dreaming

Lucid dreaming has been discussed for centuries despite its relatively recent initial experimental evidence. Several ancient meditation traditions include techniques and training in lucid dreaming, using different terminology. For instance, Tibetan "mi-lam" or "dream yoga" is a type of advanced practice in which the dreamer recognizes they are dreaming (Chang, 1963). This is taught as a strategy to awaken the consciousness of the dreamer and bring the dreamer closer to the purest form of conscious awareness, without extraneous physical and conceptual stimuli that are present during wakefulness. Hindu practices and Transcendental Meditation encourage "dream witnessing" as a form of meditation naturally available in sleep (Hunt, 1989). Western philosophers Descartes and Schopenhauer, to name a few, also discussed lucid dreaming in some of their writings (LaBerge, 1985).

Only recently has lucid dreaming been become legitimized by scientific research. Prior to scientific study, lucid dreaming was believed to be temporary waking or a type of transition stage between phases of sleep (Gackenbach, 1991). This was hypothesized primarily because lucid dreaming can be considered to have qualities from both sleep and waking life. Researchers believed that it was simply a temporary awakening rather than an intermediate state that occurs during true sleep. In 1952, researchers discovered the existence of the rapid eye movement (REM) sleep phase that differed in the quality of sleep and the reported dream experiences of subjects. During this sleep phase, subjects reported more-vivid dreams and more dreams in

general, with longer dream reports corresponding to longer periods of REM sleep (Aserinksy & Kleiman, 1953). Using electroencephalographic (EEG) and electrooculography (EOG), LaBerge (1985) trained participants to indicate dream lucidity via exaggerated eye movements during a normal REM period. Participants were instructed to move their eyes in distinctive patterns during a lucidity to indicate that they were experiencing a lucid dream, whereas typical REM sleep eyelid movement results in lower amplitudes and greater randomization of movement. This confirmed that lucid dreaming was not a partially awakened state and did in fact occur while the individual was fully asleep. It also confirmed that the individual was not simply thinking that they were in control of their dreams; it gave strong evidence to support the idea that lucid dreamers are in fact in control of their bodies and dreams during a lucid dreaming experience. Since this confirmation, a large proportion of research on lucid dreaming studied the concept within the context of both non-lucid dreaming and meditative states (Gackenbach, 1991).

The Continuity Hypothesis and Primary and Secondary Consciousness

Phenomenologically, sleeping and waking consciousness may look different. However, there are striking similarities between consciousness experiences in waking and sleep. Kahan and LaBerge (1996) examined the relationship between sleeping and waking consciousness and found that participants' dreaming and waking cognition styles were correlated. In a later study, Kahan and LaBerge (2011) noted that sleeping and waking consciousness content was more similar with respect to process features, rather than structural ones. In other words, the cognitive and sensory qualities of dreaming and waking life were therefore reported as strikingly similar, yet varied in reality orientation, logical organization, and bizarreness or typicality of events (Kahan & LaBerge, 2011). For instance, dreams may include a person walking on the ceiling

but the fear of heights and cognitive processes of how to walk remain similar. Despite dreams lacking proper reality orientation and predictability, they can maintain emotional and cognitive processes that occur in waking cognition.

The continuity hypothesis of dreaming proposes that there is a continuity between dreams and waking life, and that these two states of consciousness may rely on shared brain processes (Rider, 2012). Hobson's (2009) cognitive neuroscience approach to the understanding of consciousness in dreams and nocturnal cognition divides consciousness into primary and secondary processes. Consciousness varies widely in intensity and quality on what can be considered a continuum of conscious experiences. An individual can be fully alert and aware, awake but on "auto-pilot," asleep, or dreaming, as varying states of consciousness. These states of consciousness depend on three empirically identifiable states of the brain: waking, non-rapid eye movement (NREM) sleep, and REM sleep (Hobson, 2009). Primary consciousness refers to the simple awareness of basic perception and emotion, without reflective awareness. Secondary consciousness includes higher-order processes that are dependent upon language, including abstract thinking, volition, and metacognition. The distinction between primary and secondary consciousness in nocturnal cognition can be seen in ordinary dreaming and lucid dreaming. Normal dreams during REM sleep contain functions of primary consciousness, with simple awareness and experience, but no meta-awareness. In other words, the dreamer is not aware that the content of their experience is a dream. Lucid dreaming, however, does have characteristics of secondary consciousness, in that a person is aware of the conscious state and may exert volitional control. These distinctions can be applied to waking life as well. For instance, mind-wandering and certain affective emotional states or automatic behaviors where people are relatively unaware of their current experience are examples of primary consciousness (Schooler,

2002). These types of behavior are not task-oriented and are characteristic more of the default network, in which a person is not focused on the external world. The person is awake and experiencing things perceptually and emotionally but is not necessarily acting with volitional control and meta-awareness. Secondary consciousness experiences in wakefulness include any instances of conscious, self-reflective, purposeful action that the individual is experiencing.

Recently, Voss, Holzmann, Tuin, and Hobson (2009) demonstrated that lucid dreaming is a type of hybrid brain state between waking and sleeping consciousness circuits. Using quantitative EEG (qEEG), subjects who were trained to induce lucid dreaming were studied while sleeping in a laboratory and findings indicated that the brain activity of those who were able to enter and provide confirmation via sequential horizontal eye movements of lucid dreaming demonstrated brain activity that demonstrated aspects of both typical non-lucid REM sleep and waking conscious brain activity. This coactivation of primary and secondary consciousness circuits suggests that lucid dreaming is in fact a type of intermediary state of consciousness, with greater frontal lobe activity commonly associated with waking life. Dresler et al. (2012) applied fMRI and EEG technology to determine the neural correlates of lucid dreaming as compared to regular REM sleep. Although only a case study, their data provide evidence of frontal lobe and cortical activation during periods of lucid dreaming that are normally inactive during REM sleep, thereby verifying the reflective cognitive capabilities that are characteristic of secondary consciousness experiences.

Another study linked trait mindfulness to dreaming and negative affect (Simor, Koteles, Sandor, Petke, & Bodizs, 2011). Sampling undergraduate students in Budapest, they found that mindfulness is inversely correlated with negative affect in dreams and negative dream severity, in addition to greater emotional processing and regulation. Trait mindfulness may act upon

waking anxiety, which therefore reduced dream anxiety (Simor et al., 2011). These results indicate that mindfulness may act as a predictive factor against dream anxiety by acting upon waking anxiety levels, consistent with the continuity hypothesis.

Purposeful engagement in secondary consciousness experiences like mindfulness is associated with several health benefits (for a review, see Keng, Smoski, & Robins, 2011). Primary consciousness experiences during waking can become detrimental, such as in the case of rumination in depression. Killingsworth and Gilbert (2010) found that mind-wandering, typically considered the antithesis of mindfulness practices, correlates with lower levels of happiness in any given situation. Therefore, it appears that fostering an ability for meta-awareness in waking life can be highly productive and beneficial. The question remains as to whether or not these same benefits transfer to meta-awareness during nocturnal cognitions.

Characteristics of Lucid Dreamers

Schredl and Erlacher (2011) estimated that about half of the population has experienced a lucid dream in their lifetime, with about 20% experiencing regular dream lucidity (Schredl & Erlacher, 2011; Snyder & Gackenbach, 1988). Saunders, Roe, Smith, and Clegg (2016) conducted a quality-effects meta-analysis on lucid dreaming incidence that included data from 34 studies from 1966 to 2016. A quality-effects meta-analysis differs from a standard random-effects meta-analysis in that it takes into account the heterogeneity of effects in the analysis of the overall interventional efficacy as well as the measured methodological heterogeneity. In other words, this type of meta-analysis better accounts for the quality of the studies included in the analysis. Data from this study suggest that about 55% of people have experienced one or more lucid dreams in their lifetime. Of those individuals, 23% experience lucid dreams once a month or more (Saunders et al., 2016), with no suspected sources of variability regarding age,

gender, or ethnicity. Smaller studies have reported different findings across gender and age variables, but these appear to be explained by methodological or sampling issues (Zink & Pietrowsky, 2015). Because women have greater dream recall in general, women tend to experience more frequent nightmares and report greater dream recall for both lucid and non-lucid dreams (Schredl, 2003; Schredl & Erlacher, 2011). Women also tend to utilize lucid dreaming for problem solving twice as much as do men (Schädlich & Erlacher, 2012), which may be due to the fact that they have more frequent nightmares. Thus, in theory, women may be using lucid dreaming as a type of self-treatment for their more frequent nightmares. Some studies have found lucid dreaming frequency negatively correlated with age (Schredl & Erlacher, 2011), however dream recall may also diminish with age (Giambra et al., 1996; Stepansky et al., 1998), rendering lucid dream recall frequency a simple function of general dream recall and not actual lucid dreaming occurrence (Zink & Pietrowsky, 2015). Voss, Frenzel, Koppehele-Gossel, and Hobson (2012) studied young school children and adults and found that lucid dreaming occurs most often in young children, but sharply declines around age 16. However, the prevalence of having experienced at least once lucid dream increases after age 16 to about 70-80 percent (Voss et al., 2012). Thus, the prevalence of ever having experienced a lucid dream appears rather high, but the frequency of lucid dreaming appears more variable.

Several studies have demonstrated continuity between characteristics of lucid dreaming and aspects of an individual's personality. For instance, Blagrove and Hartnell (2000) found that frequent lucid dreamers tend to demonstrate high internal locus of control and openness to experience. Another study examined lucid dreaming in the context of the 16PF personality factors (Catell et al., 1970) and found that individuals who experience more frequent lucid dreams tend to rank higher on the dominant, socially bold, experimenting, enthusiastic, and

warm traits (Gruber, Steffen, & Vonderhaar, 1995). In addition, Hess, Schredl, and Goritz (2017) examined lucid dreaming frequency and the Big Five personality dimensions (McCrae, 1994), finding that lucid dream frequency was positively correlated openness with experience, but negatively correlated with agreeableness. Authors suggest that openness to experience lends the individual to open-minded and imaginative experiences, which lead to the discovery and practice of lucid dreaming, whereas lucid dreamers are also focused on satisfying personal needs which is incongruent with agreeableness (Hess, Schredl, & Goritz, 2017). Another study found that frequent lucid dreamers tended to be more assertive and self-confident than rare- or non-lucid dreamers (Doll, Gittler, & Holzinger, 2009). It is theorized that lucid dreaming can operate as an arena for problem-solving and decision-making that can facilitate more effective processing and coping in waking life (Doll, Gittler, & Holzinger, 2009; LaBerge, 1985), but the directionality of these relationships remains unknown. Overall, there seem to be several links between waking and sleeping characteristics to support the continuity hypothesis of dreaming and, more specifically, of lucid dreaming.

Lucid Dreaming and Meditation

Hunt (1989) posits that lucid dreaming and meditation are closely linked because the physically detached and inactive state of meditative practices closely resembles the social withdrawal and enforced stillness of sleeping. Indeed, several connections have been drawn between lucid dreaming and meditation (Gackenbach & Bosveld, 1990; Hunt, 1989; Hunt & Ogilvie, 1988). For instance, lucid dreaming is more likely to occur on nights where the subject meditated the day before than when the subject did not engage in meditation (Reed, 1978). Lucid dreaming frequency can also increase when the subject meditates in the middle of the night (Sparrow, Thurston, & Carlson, 2013). In general, those who meditate report more lucid

dreams than those who do not meditate, and meditation practice length is correlated with lucid dream frequency (Gackenbach, Cranson, & Alexander, 1986; Hunt & Ogilvie, 1988). In other words, experienced meditators report more lucid dreams than novice meditators, who report more dreams than people who have never experienced meditation.

Connections Between Mindfulness and Lucid Dreaming

Although some studies have demonstrated a connection between meditation and lucid dreaming, few have examined the connections between trait mindfulness in waking life and lucid dreaming. Keeping in line with the continuity hypothesis, the secondary consciousness aspects of lucid dreaming including reflection, self-awareness, and volition, may be reflected in waking life as well in the form of mindfulness.

Stumbrys (2011) first hypothesized a relationship between dream lucidity and waking mindfulness based on the continuity hypothesis. Rider (2012) then examined the relationship between mindfulness and lucid dreaming by having 44 participants complete measures of mindfulness and recording daily dream qualities that assessed for dream lucidity, cognition, and emotional intensity. Rider used both the Mindful Attention and Awareness Scale (MAAS; Brown & Ryan, 2003) and the Philadelphia Mindfulness Scale (PHLMS; Cardaciotto, 2005) to measure mindfulness. The MAAS yields a single factor of self-report mindfulness, whereas the PHLMS assesses for awareness and accepting components of mindfulness. Rider (2012) did not find a significant relationship between dream lucidity and waking mindfulness, but the data did indicate that a higher degree of mindfulness in dream content was associated with increased waking mindfulness. In other words, mindfulness expressed in waking was comparable to that expressed in dreams, although full lucidity may not have been present. This evidence supported the continuity hypothesis of dreaming, but was limited by methodological concerns, including

small sample sizes and the lack of lucid dreaming reports. Only 10.6% of the small sample were frequent lucid dreamers and only 3 of 209 dream reports clearly demonstrated lucidity (Rider, 2012). The study also included only current lucid dreams, not necessarily a history of lucid dreaming experience.

Another study sought to remove these methodological difficulties by sampling from a lucid dreaming community that had greater likelihood of experiencing lucid dreams. Stumbyrs, Erlacher, and Malinowski (2015) studied the relationship between lucid dreaming, meditation, and mindfulness via an online survey of 528 individuals aged 11-67 who were recruited from a lucid dreaming website. Researchers found that lucid dreaming was in fact correlated with dispositional mindfulness; however, this effect was no longer significant when controlling for meditation practice. Mindfulness was significantly correlated with lucid dreaming frequency in those who meditated, but not for participants who indicated high degrees of mindfulness without meditation practice. This study also demonstrated several methodological issues, one being the use of the Freiberg Mindfulness Inventory (FMI; Walach et al., 2006) yielding a single-factor mindfulness score. Given the diverse range of experiences that can be associated with mindfulness, using a single-factor score may miss important mindfulness factors that are in fact related to lucid dreaming. This study also used a homogenous sample of lucid dreamers, which may have limited the possibility of finding patterns (Stumbrys et al., 2015). Those who seek out a lucid dreaming website are likely to be a unique group of individuals who already have an interest in this area. Furthermore, the study lacked participants who do not experience lucid dreams as a control group.

Blagrove, Bell, and Wilkinson (2010) found that a sample of 22 lucid dreamers were better able to perform on the Stroop Task compared to a group of 20 non-lucid dreamers. The

Stroop task asks participants to inhibit an overlearned response by naming the ink color of a color word when there is a mismatch between ink color and word. Similar to lucid dreaming, this requires participants to maintain primary and secondary cognitive states of awareness. Although this finding does not explicitly point to a connection between waking mindfulness and lucid dreaming, it does provide evidence supporting the continuity in attentional ability and self-awareness between waking and dreaming cognition. One more-recent study examined the relationship between mindfulness and lucid dream frequency as a function of volitional control during lucid dreams (Stumbrys & Erlacher, 2017). Using the same sample and methodology as Stumbrys et al. (2015), authors found that the main predictors of lucid dream control were higher lucid dream frequency and waking dispositional mindfulness, as well as younger age. Thus, there seems to be a relationship between lucid dreaming and waking mindfulness such that lucid dreaming frequency may be a function of dispositional mindfulness and of practice. Yokusoglu et al. (2017) administered measures of lucidity and consciousness in dreams, metacognition, and anxiety to examine the degree of lucidity and its relation to metacognitive beliefs and dream anxiety in a group of medical students who tend to face high pressured situations and abnormal sleeping patterns. They found metacognition in waking life; positive thoughts about one's ability to handle worry and tendencies to think about one's own thoughts were correlated with dream lucidity. The authors utilized a fairly large sample ($N = 916$), however it was limited to medical students and thus may be less generalizable than other studies.

Finally, authors of a recent study examined the relationships between lucid dreaming, mindfulness, and meditation using a number of different experimental designs to account for the limitations of the previously mentioned studies (Baird, Rieder, Boly, Davidson, & Tononi, 2018). Participants were asked to complete questionnaires regarding their lucid dream

frequency, trait mindfulness, and meditation practice history. Researchers measured trait mindfulness using the Toronto Mindfulness Scale (TMS; Lau et al., 2006) and the Five Facet Mindfulness Questionnaire (FFMQ; Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006; Baer et al., 2008). Baird et al. (2018) then conducted a blinded, randomized controlled design evaluating the effects of an 8-week MBSR course on lucid dreaming frequency. Researchers used the same lucid dreaming frequency scale developed by Schredl and Erlacher (2004) and measured trait mindfulness using the Toronto Mindfulness Scale (TMS; Lau et al., 2006) and the Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006, 2008). The TMS yields two factors of mindfulness, Curiosity and Decentering, whereas the FFMQ yields five dimensions of mindfulness: Observing; Describing; Acting with Awareness; Nonjudging of Inner Experience; and Nonreactivity to Inner Experience (Baer et al., 2008). Participants were divided into meditation-naïve individuals who did not have significant training in meditation and long-term meditators, who must have at least 5 years of meditation experience averaging 200 minutes per week in addition to 5 weeks experience in meditation retreats. The researchers found that long-term meditators have more frequent lucid dreams, whereas general dream recall frequency was not significantly different between groups. Across the entire sample, frequent lucid dreamers (anyone who had more than one lucid dream per month), demonstrated greater ability to describe their experiences, as indicated by the Describing subscale of the FFMQ. Within the long-term meditator subgroup, those with more frequent lucid dreams reported higher scores for Observing and Acting with Awareness subscales of the FFMQ and the Decentering subscale of the TMS. Within the meditation naïve subgroup, frequent lucid dreamers had higher Describing scales on the FFMQ, with no other significant differences. Following the 8-week mindfulness course, researchers found no increase in lucid dreaming frequency and no change compared to the

control group. Together, these results provide stronger evidence to support the continuity hypothesis of increased meta-awareness in sleep and waking. More specifically, mindfulness, meditation, and lucid dreaming frequency seem positively associated with one another, but causal relationships remain unclear (Baird et al., 2018). Baird et al. (2018) also recognize that the results of their study may apply only to highly advanced meditators, and may reflect traits already possessed rather than acquired during meditation practice.

Implications for the Present Study

There is now some evidence to support the claim that mental and physical health are both associated with both mindfulness and lucid dreaming (Chambers, Gullone, & Allen, 2009; Gackenbach & Bosveld, 1991; Jones & Stumbrys, 2014; LaBerge, 1985). There also seems to be considerable evidence to support the continuity hypothesis as it applies to lucid dreaming, in that many aspects of a person's waking life are related to qualities of lucid dreaming. Even so, previous research connecting waking mindfulness and lucid dreaming used crude mindfulness measures that only measure aspects of presence or acceptance. These studies use narrowband measures that do not identify a full range of specific RMM States, some of which may correlate with lucid dreaming frequency. Previous studies also used samples that contained few frequent lucid dreamers. Given the limitations of previous research on this topic, the purpose of this study is to further clarify the relationships between lucid dreaming, mindfulness, and meditation using measures that are more sensitive to individual differences within each construct. The relationships between these variables are currently unclear. This study aims to clarify the connections among these variables and provide a richer understanding of how mindfulness and meditation relate to lucid dreaming frequency.

Moreover, lucid dreams are interesting in that they can be spontaneous events, and individuals can also be trained to induce lucid dreams through autosuggestion before sleeping (LaBerge, 1985; Voss, Holzmann, Tuin, & Hobson, 2009). In other words, a person can tell herself that she will have a lucid dream that night with intention before bed, which will increase the likelihood of her having a lucid dream. The question of whether or not lucid dreaming training can result in improved cognitive or emotional processing that is of clinical value remains to be seen, but this would be an important longitudinal study for further research (Voss et al., 2009). Establishing a connection between lucid dreaming and various RMM States would clarify the relationships among lucid dreaming, meditation, and mindfulness, and provide a richer picture of the connections between waking and sleeping meta-cognition.

Despite the connections drawn between lucid dreaming and mental health, lucid dreaming has only recently been applied as a treatment technique. Its main application has been for the treatment of nightmares (Abramovitch, 1995; Brylowski, 1987, 1990; Halliday, 1982a, 1982b, 1988; Spoormaker, 2006; Spoormaker, van den Bout, & Meijer, 2003; Tholey, 1981, 1988; Zadra & Pihl, 1997). Those who experienced lucid dreaming reported it as a type of self-remedy to help them better manage emotions (Doll, Gittler, & Holzinger, 2009), which is much like what mindfulness meditation does for an individual in waking life. Using a cross-sectional design, Doll et al. (2009) found that frequent lucid dreamers demonstrate better mental health, fewer complaints, and higher degrees of assertiveness, autonomy, and self-confidence than those who were rare and non-lucid dreamers. This study does not provide a causal explanation for these relationships, but it is possible that teaching individuals how to lucid dream could result in psychological benefits. Given what we know about the characteristics of lucid dreamers and the beneficial effects of mindfulness and meditation, lucid dreaming could also be a rich avenue for

mental health treatment. Fostering mindfulness in waking life has clear health benefits, and if lucid dreaming is related to mindfulness, it could also be utilized as a possible technique for fostering mindfulness in waking and improving overall quality of life.

Hypotheses

The present study examined the relationship between broad- and narrowband measures of mindfulness and lucid dreaming frequency, with meditation practice history as a potential mediating variable. Specifically, the present study was designed to examine the relationship between RMM states and dimension, the amount and type of practice with meditation, and lucid dreaming frequency.

The following hypotheses were proposed for this dissertation.

1. Individuals who report greater degrees of mindfulness will report greater lucid dreaming frequency. Specific RMM Dimensions will predict higher lucid dreaming frequency.
2. RMM dimensions will account for a greater portion of the variance of frequency of lucid dreaming than the single score or two factor FMI scores.
3. Individuals who report greater frequencies of meditation practice will report greater lucid dreaming frequency.
4. Specific RMM Dimensions will correlate with meditation practice history.
5. Meditation practice history and RMM Dimensions together will predict greater lucid dreaming frequency than either variable alone.

To test these hypotheses, participants were recruited from Roosevelt University and from local meditation centers in the Chicago area. This was done to ensure a diverse range of

meditation and mindfulness experience. Participants were then administered self-report measures related to lucid dreaming frequency, mindfulness, and meditation practice history.

Methods

Participants

Participants were at least 18 years old (M = 31.71 years, sd = 17.82). Participants included Roosevelt University undergraduate students (n = 150) and meditators at private institutions across Chicago that promote and teach mindfulness practices (n = 71). Participants were involved in a variety of meditative practices including Tai Chi, yoga, peace breathing, and silent mindfulness meditation. Sixty-four participants (29.5%) were male, 152 were female (70%), and 1 participant identified as "Other." Participants were primarily heterosexual (79.3%). Twenty-three participants identified as bisexual (10.6%), 6 identified as gay, 4 as queer, 4 as lesbian, 5 as Other, and 3 declined to answer. Participants racially and ethnically identified as White (52.5%), Hispanic (19.4%), African American (11.5%), Multiracial/Other (9.7%), and Asian (6.9%). A total of 221 participants completed the questionnaires; however, only 217 participants were included in the final analyses. I excluded 4 participants due to careless answering or multiple full questionnaires left blank. Participants were required to be proficient in English and have the ability to read English to participate.

Measures

Mindfulness. To assess the participant's dispositional mindfulness, each participant was administered the Freiberg Mindfulness Inventory (FMI) and Relaxation, Meditation, and Mindfulness Experiences Questionnaire trait version (RMMf). Together, these measures provided a broad-spectrum (RMMf) and narrow-spectrum (FMI) assessment of mindfulness experience.

Freiberg Mindfulness Inventory. The FMI is based on classical Buddhist definitions of mindfulness (Brown, Creswell, & Ryan, 2015). It consists of 14 items scored on a 4-point scale (1 = rarely; 2 = occasionally; 3 = fairly often; 4 = almost always), with higher scores indicating greater levels of mindfulness (Walach et al., 2006). The FMI is a single factor measure with good reliability (Cronbach's alpha = .86; N = 243; Walach et al., 2006). Walach et al. (2006) described the single FMI factor to simultaneously describe a cognitive factor, a process factor, an aspect of acceptance, and non-judgmental attitudes, depending on what is being considered. The reliability of the single-factor FMI score in the present study was good (Cronbach's alpha = .81). Stumbrys et al. (2015) used an alternative two-factor solution initially proposed by Kohls et al. (2009) with subscales of Presence and Acceptance. The subscale of Presence included six of the 14 items and Acceptance included the remaining eight. This two-factor solution for Presence and Acceptance demonstrated acceptable reliability for Stumbrys et al. (2015; Cronbach's alpha: .68 and .75, respectively; N = 528) as well as for Kohls et al. (2009; .69 and .77, respectively; N = 241). In the present study, the Cronbach's alpha coefficients for the two-factor solution were questionable: .59 for Presence and .73 for Acceptance. The FMI traditionally yields one score of mindfulness. The present study used both the one and two-factor solutions to permit direct comparison to the findings of Stumbrys et al. (2015).

The Relaxation, Meditation, and Mindfulness Experiences Questionnaire, Frequency version. The Relaxation, Meditation, and Mindfulness Experiences Questionnaire trait version (RMMf) was designed to assess for how often a person has experienced each of the RMM States over the past year (Smith, 2017). The RMMf is a 25-item self-report questionnaire that asks participants to rate how often they have experienced each of the 25 RMM States on a 12-point scale from "Never," to "About every day." Respondents were instructed to skip items that they

do not understand or do not experience at all (see Appendix B for item content). Reliabilities for each of the dimensions measured by the RMMf are reported in Table 2. Scoring is based on Smith's 2018 protocol (see Appendix F for scoring key).

Table 2

Reliabilities for RMMf and FMI

Factor/Dimension	Cronbach's α
FMI—total score	.806
FMI—presence	.585
FMI—acceptance	.743
RMMf Level 1 – Mindful Basic Relaxation	.659
RMMf Level 2 – Mindful Quiet Focus	.792
Basic Mindfulness: Focus	.639
Basic Mindfulness: Quiet	.809
RMMf Level 3 – Mindful Awakening	.575
RMMf Level 4 – Mindful Deepening	.732
RMMf Level 5 – Mindful Transformation/ Transcendence	.767
RMMf Level +1 – Mindful Transcendent Positive Emotion	.808

Note. For exploratory purposes, I determined the alpha reliability, for Level 1 including only RMM 2-4 without RMM 1 "Far Away." Cronbach's alpha = .77; $M = 27.07$, $sd = 6.58$, $N = 212$.

Meditation practice history. Participant's history of meditation practice was assessed using a questionnaire developed by Stumbrys et al. (2015). Participants were asked if they have any experience with meditation (yes/no), and if they had, how often they currently meditate and what kind of meditation they practice. For consistency, a simple definition of meditation was provided: "Meditation is any practice where you focus your mind on a particular object, thought or activity to achieve a mentally clear and emotionally calm state." Participants' responses for meditation practice history yielded a discrete categorical variable of practice with meditation (yes/no) as well as a continuous variable of meditation practice history on a 7-point Likert scale (0 = never; 1 = less than once a month; 2 = about once a month; 3 = twice or three times a

month; 4 = about once a week; 5 = several times a week; and 6 = almost every morning) to be used in post-hoc analyses. In addition, participants were given options to choose from regarding what type of meditation they practice (i.e., FAs, FAc, or OM) with definitions of each. Participants were also allowed to select options like "mindfulness," "relaxation exercises" and an "other" option, and fill-in what specific type of meditation they have practiced (See Appendix C). Participants may regularly engage in more than one type of meditation, so the type of meditation practiced was also asked. This was done in order to create discrete variables for analyses to determine if there are differences between meditation types as they relate to lucid dreaming.

Dreaming and lucid dreaming frequency. Participants were asked to estimate their dream recall frequency using a 7-point scale based on one developed by Schredl (2004). The Schredl scale has demonstrated high retest reliability ($r = 85$; $p < .001$; and $N = 198$). The scale asks how often the participants remember their dreams and can respond 0 = never, 1 = less than once a month, 2 = about once a month, 3 = twice or three times a month, 4 = about once a week, 5 = several times a week, and 6 = almost every morning (see Appendix D). This questionnaire was included to ensure that lucid dreaming frequency is not merely a function of dream recall frequency.

Participants were then asked to answer (yes/no) if they have experienced a lucid dream. A simple definition of lucid dreaming was provided to ensure clarity and continuity of experience. The question asked, "Have you ever experienced a lucid dream? Lucid dreaming is when you are aware that you are dreaming during the dream. In a lucid dream, you may simply be aware that you are dreaming, or you may be able to control the dream." If the participant answered affirmatively, lucid dream frequency was assessed on a 7-point Likert scale similar to

the dream recall frequency scale, where 0 = never; 1 = less than once a year; 2 = about once a year; 3 = about 2 to 4 times a year; 4 = about once a month; 5 = about 2 to 3 times a month; and 6 = about once a week; 7 = several times a week (see Appendix E). The present scale was fashioned on Stumbrys' scale ("In a lucid dream, one is aware that one is dreaming during the dream. Thus, it is possible to wake up deliberately, or to influence the action of the dream actively, or to observe the course of the dream passively;" p. 419). Stumbrys' scale has demonstrated high retest reliability ($r = .89$; $p < .001$; and $N = 93$; Stumbrys, Erlacher, & Schredl, 2013a). The lucid dreaming variable was analyzed as a continuous variable using the 7-point Likert scale developed by Stumbrys et al. (2015).

Procedure

Participants included Roosevelt University students and meditation practitioners from a variety of Chicago mindfulness and mindfulness-related programs. Researchers obtained written approval from each institution to recruit participants from their meditation classes. Written consent was then obtained from each individual participant for participation in the present study and for data collection and analysis. Participants were handed a consent form prior to completing the questionnaires. Participation in the study was not a prerequisite for participating in any of the services offered at any of the institutions either at that time or at any point in the future. Participants were allowed to withdraw their consent at any time without consequence and discontinue participation in the study. Once participants were informed of the study and consented to participate, they were given the FMI, RMMf, and questionnaires on demographic information, lucid dreaming frequency, and meditation practices. Consent was given and this procedure was approved by the Roosevelt University Institutional Review Board.

Power Analysis

Using the software G-power (Faul, Erdfelder, Buchner, & Lang, 2007), it was determined that a sample size of 120 subjects, with 60 participants per group (meditation practice history yes/no) was necessary to detect a medium to large effect size ($d = 0.7$).

Results

Descriptive statistics for main study variables are located below in Table 3. Descriptive statistics for all RMMf items are located in Table 4. Many of the individual RMMf items (2, 3, 5-9, 12-15, 18-24) were negatively skewed, with modes of 12, the highest response possible on the measure. RMMf items "Clear, Awake Aware," "Interested, Curious, Fascinated," "Loving, Caring, Compassion," and "Thankful" all resulted in means above 10.

Table 3

Summary of descriptive statistics for main study variables

Variable	*N*	Mean	Standard Deviation
Lucid Dreaming Frequency	217	2.82	2.30
Meditation Practice Frequency	217	2.81	2.25
FMI- total score	214	39.72	6.20
FMI- Presence	214	18.24	2.59
FMI- Acceptance	217	16.53	4.22
Level 1: Mindful Basic Relaxation	206	8.57	2.00
Level 2: Mindful Quiet Focus	214	8.98	2.05
Level 2a: Basic Mindfulness: Focus	214	9.69	2.13
Level 2b: Basic Mindfulness: Quiet	216	8.53	2.52
Level 3: Mindful Awakening	212	9.90	1.58
Level 4: Mindful Deepening	211	8.35	2.32
Level 5: Mindful Transformation/ Transcendence	211	7.54	3.08
+1: Mindful Transcendent Positive Emotion	216	10.33	1.83
RMM 6: Fantasy	216	9.50	2.21

Table 4

Summary of descriptive statistics for all RMMf items

RMMf Item	*N*	Mean	*SD*
RMM 1: Far Away	209	7.42	3.33
RMM 2: Physically Relaxed	215	9.16	2.85
RMM 3: At Ease, At Peace	215	9.07	2.60
RMM 4: Refreshed	214	8.85	2.48
RMM 5: Pleasant Mind Wandering	216	9.79	2.21
RMM 6: Fantasy and Daydreaming	206	9.50	2.66
RMM 7: Focus, Absorption	214	9.84	2.50
RMM 8: Centered, Grounded	216	9.56	2.46
RMM 9: Quiet	216	8.60	3.11
RMM 10: Unbothered	216	8.37	2.93
RMM 11: Easy, Effortless	216	8.61	2.85
RMM 12: Clear, Awake, Aware	215	10.07	1.88
RMM 13: Interested, Curious, Fascinated	216	10.74	1.68
RMM 14: Beautiful	215	9.93	2.46
RMM 15: Observer	213	8.78	3.23
RMM 16: Going Deeper	214	8.23	2.82
RMM 17: Spaciousness, Expansiveness	211	7.78	2.80
RMM 18: Sense of Something Greater	216	8.34	3.83
RMM 19: Meaning, Purpose, Direction	215	9.07	2.94
RMM 20: Reverent, Prayerful	214	7.23	4.17
RMM 21: Awe/ Wonder, Deep Mystery	214	8.86	3.02
RMM 22: “Spiritual” or “Mystical,”	211	6.52	3.93
RMM 23: Happy, Optimistic, Trusting	216	9.49	2.58
RMM 24: Loving, Caring, Compassion	216	10.79	1.86
RMM 25: Thankful	216	10.72	1.95

Main Analyses

Correlation coefficient matrix. Pearson correlation coefficients (r) for all study variables are located in Table 5. Dream recall frequency was not significantly correlated with any mindfulness variables, with the exception of RMM6 Fantasy ($r = .220$, $p = .001$). Therefore, it appears that lucid dreaming frequency was not associated with simple dream recall. All RMMf variables, with the exception of the exploratory RMM state 6 Fantasy, correlated ($p < .01$) with the FMI total score and two factors, Presence and Acceptance. Hypothesis 1, which postulated

that individuals who endorse greater degrees of mindfulness will endorse greater lucid dreaming frequency, was partially supported. Specific RMM variables of Basic Mindfulness—Quiet, Mindful Deepening, Mindful Transformation/ Transcendence, and RMM 6 Fantasy—significantly correlated with higher lucid dreaming frequency. Notably, neither the total FMI score or either of the two FMI factors, Presence and Acceptance, significantly correlated with lucid dreaming frequency. Hypothesis 2, that individuals who endorse greater frequencies of meditation practice will endorse greater lucid dreaming frequency, was not supported, $r = 0.073$, $n = 217$, $p = 0.286$. Hypothesis 3, that specific RMM dimensions correlate with meditation practice history, was supported. All FMI scores and RMMf variables, with the exception of RMM 6 Fantasy, significantly correlated with meditation practice (see Appendix I).

Table 5

Correlations between RMM Dimensions, FMI Factors, and Lucid Dreaming Frequency.

Measures	Lucid Dreaming Frequency	Meditation Practice Frequency
Meditation Practice Frequency	.073	--
FMI—total	.104	.303**
FMI—Presence	.066	.202**
FMI—Acceptance	.109	.325**
RMMf Basic Mindful Relaxation	.078	.431**
RMMf Basic Mindfulness: Focus	.037	.276**
RMMf Basic Mindfulness: Quiet	.163*	.283**
RMMf Mindful Awakening	.105	.299*
RMMf Mindful Deepening	.244**	.409**
RMMf Mindful Transformation/ Transcendence	.273**	.383**
RMMf Mindful Positive Emotion	.087	.203**
RMMf Mind Wandering (RMM 5)	.117	.243**
RMMf Fantasy (RMM 6)	.173*	-.056
RMMf Mindful Quiet Focus	.142*	.314**

* = $p \leq 0.05$
** = $p \leq 0.01$

Multiple Regression. I then conducted several multiple regressions to clarify the relationships between lucid dreaming frequency, trait mindfulness, and meditation practice history. Multiple regression analysis allows for the analysis of covariation of one dependent variable (lucid dreaming frequency) with several independent (mindfulness and meditation) variables. Before running the regressions, I examined the correlation matrix of study variables including the RMMf levels, FMI total score, FMI- Presence, FMI-Acceptance, LD frequency, and meditation practice history to determine what relationships were significant (Table 5). To reduce the degrees of freedom in the regression model and thereby increase its statistical power, only variables that correlated with significance $p \leq .05$ were included in the regression model. None of the FMI scores, single factor or two-factor, was significant, but the two-factor scores were included in the stepwise regression nonetheless for comparison to previous studies. I ultimately included 4 predictor variables in the regression model, and these subscales were Basic Mindfulness: Quiet, Mindful Deepening, Mindful Transformation/ Transcendence, and RMM 6 Fantasy. The normality of residuals with Lucid Dreaming Frequency were evenly distributed. However, the distribution was slightly platykurtic.

I conducted a stepwise multiple regression to compare the RMMf variables and the two-factor structure of the FMI (FMI- Presence and FMI- Acceptance) to determine which measure accounts for more of the variance in lucid dreaming frequency. The first step of this stepwise regression regressed LD scores on the two factors of the FMI: Presence and Acceptance. Despite the correlations being nonsignificant, I ran this analysis to address Hypothesis 3. The second step regressed lucid dreaming frequency on the RMMf variables. This explained how much of the variance in LD frequency is associated with each of the RMMf variables and each of the FMI factors. The first regression solution was not significant, $F(2, 203) = 1.053$, $p = .351$, with an R^2

of 0.01. The second regression was significant, $F(6, 199) = 3.654$, $p = .002$, with an R^2 of .099. Approximately 9.9% of the variance in lucid dreaming frequency was explained by the independent variables outlined in Table 6. Upon examining the main effects, L5 Mindful Transformation/Transcendence ($p = .036$, $\beta = .216$) and RMM 6 Fantasy ($p = .041$, $\beta = .142$) most strongly predicted a higher lucid dreaming frequency.

Table 6

Summary of stepwise multiple regression for FMI and RMM variables

Model	Independent Variable	B	□	t	Significance
1	Constant	1.790		1.56	.118
	FMI- Presence	.012	.136	.149	.882
	FMI- Acceptance	.050	.092	1.021	.309
2	Constant	-.152		-.119	.905
	FMI- Presence	-.017	-.020	-.225	.823
	FMI- Acceptance	-.008	-.015	-.156	.877
	Level 2b: Basic Mindfulness Quiet	.084	.092	1.179	.240
	Level 4: Mindful Deepening	.035	.035	.323	.747
	Level 5 Mindful Transformation/ Transcendence	.161	.216	2.117	.036*
	RMM 6: Fantasy	.128	.142	2.057	.041*

Note. Adjusted $R^2 = .001$, $F = 1.053$ ($p = .351$) for Model 1; Adjusted $R^2 = .072$, $F = 3.654$ ($p = .002$) for Model 2

The final analysis was another stepwise regression to determine if any moderation effects are present. Meditation experience's (yes/no) influence on the relationship between RMMf variables and LD Frequency was assessed to determine moderation effects, which were found in Stumbrys et al. (2015). The first component of this moderation analysis regressed lucid

dreaming frequency on RMMf predictor variables. This demonstrated how much of the variance in lucid dreaming frequency can be explained by various RMMf variables. The first step of the model was significant, $F(4, 203) = 5.510$, $p < .000$, with an R^2 of .098. Because this regression was statistically significant, I proceeded with the second regression, which regressed lucid dreaming frequency on both RMMf variables and meditation practice history. If meditation practice history was in fact a moderator, a changed R^2 would indicate that meditation practice history explains an additional amount of the variation from the dependent variables (RMMf variables). This second step was not significant, $F(5, 202) = 4.456$, $p = .001$) with an R^2 change of .001 and an R^2 of .099. The R^2 did not change significantly, indicating that RMM variables predict lucid dreaming frequency independently. Given that meditation practice history did not result in a significant change in R^2, the third regression, where lucid dreaming as the independent variable would be regressed on an interaction variable of RMMf with meditation practice history (yes/no), was not carried out.

Given that experience with meditation did not significantly contribute to the model, and in fact, weakened it, I examined the meditation variable in greater detail. After reviewing a histogram of the distribution of meditation practice frequency, I discovered a bimodal distribution showing two sample groups. In line with my planned post-hoc analyses, I dichotomized the variable into high/low meditators. The median was 3, so I recoded the variable responses into dummy variables, where a self-report meditation frequency score of 0-3 was recoded as 0 and a self-report score of 4-6 was recoded as 1. I re-ran the regression model and meditation practice frequency was again not significant. Recoding the variables helped the model, but it still did not significantly predict lucid dreaming frequency. We then hypothesized that only regular, almost daily meditation may have an effect. We ran the model once more with

a different distribution in the dummy-coded variables, comparing frequent (almost daily) meditators with self-reported score of 6, to infrequent meditators and meditation-naïve individuals (self-report score of 0-5). This resulted in another nonsignificant predictor model.

Table 7

Summary of stepwise multiple regression for RMM variables and meditation practice history

Model	Independent Variable	B	□	*t*	Significance
1	Constant	-.443		-.536	.593
	Level 2b Basic Mindfulness: Quiet	.068	.075	1.034	.302
	Level 4 Mindful Deepening	.035	.036	.339	.735
	Level 5 Mindful Transformation/ Transcendence	.158	.212	2.090	.038*
	RMM 6 Fantasy	.126	.139	2.051	.042*
2	Constant	-.464		-.560	.576
	Level 2b Basic Mindfulness: Quiet	.073	.080	1.101	.272
	Level 4 Mindful Deepening	.046	.046	.431	.667
	Level 5 Mindful Transformation/ Transcendence	.163	.219	2.139	.034*
	RMM 6 Fantasy	.123	.136	1.996	.047*
	Meditation Practice Frequency	-.043	-.042	-.560	.576

Note. Adjusted R^2 = .080, F = 5.510 (p =.000) for Model 1; Adjusted R^2 = .077, F = .313 (p =.576) for Model 2

Exploratory post-hoc analyses. To further analyze the data, I conducted exploratory post-hoc analyses of meditation practice and lucid dreaming frequency. Given that I collected data on type of meditation practiced, I ran an Analysis of Variance (ANOVA) to determine if any specific type of meditation practice is associated with greater lucid dreaming frequency than

others. The dependent variable of lucid dreaming was analyzed along with the types of meditation practiced most by participants. Subjects could have answered FAs, FAc, OM, or "An Even Mix of Types." Definitions were provided for each of these meditation types. Many participants selected multiple items, although the intention of the questionnaire was for each participant to select only one option. For the purposes of this analysis, participants who selected multiple types were grouped into the category of "An Even Mix of Types," even though some may have not selected this for meaningful reasons. For instance, participants may only practice OM and FAc, so "An Even Mix of Types" is not entirely accurate. Therefore, the option "An Even Mix of Types" was redefined as, "A Mix of Types." A main effect of "meditation type practiced most" approached significance for lucid dreaming frequency, $F(3, 164) = 2.401$, $p < .07$. A Tukey post hoc test revealed that those who practice FAc alone ($M = 3.82$, $SD = 2.13$) reported more frequent lucid dreams than did those who practiced FAs alone ($M = 2.38$, $SD = 2.11$), with a tendency toward significance of $p = .058$.

Discussion

The present study offers a deeper look at the relationships among mindfulness, meditation, and lucid dreaming frequency. Lucid dreaming and mindfulness are experiences requiring metacognition, or awareness of awareness. Mindfulness and meditation require awareness of the present moment during waking, and lucid dreaming requires one to be aware one is dreaming. Most mindfulness questionnaires are narrowband measures, assessing only commonly described features of mindfulness like presence, awareness, and acceptance. This study used two measures of mindfulness: a narrowband measure, the Freiberg Mindfulness Inventory (FMI; Walach et al., 2006); and a broadband measure, The Relaxation, Meditation,

Mindfulness Experiences Questionnaire, frequency version (Smith, 2019; RMMf) which measures 25 RMM states associated with relaxation, meditation, and mindfulness.

All FMI and RMMf mindfulness variables with the exception of the single item RMM 6 Fantasy significantly correlated with meditation practice history, indicating a positive relationship between meditation practice frequency and both broad- and narrowband assessments of mindfulness. All mindfulness variables except Fantasy also correlated with one another. Somewhat surprisingly, no narrowband mindfulness variables from either the FMI or the RMMf correlated with lucid dreaming frequency. Neither FMI mindfulness total score nor the two FMI factors of Presence and Acceptance predicted lucid dreaming frequency. Meditation practice history also did not predict lucid dreaming frequency. Lucid dreaming frequency did significantly correlate with RMM variables Basic Mindfulness: Quiet, Level 4 Mindful Deepening, Level 5 Mindful Transformation/Transcendence, and exploratory item RMM 6 Fantasy. Multiple regression analyses determined that roughly 8.8% of the variance in lucid dreaming frequency could be explained by mindfulness variables of RMM Level 4 Mindful Transformation /Transcendence and RMM 6 Fantasy. In other words, those who report more frequent lucid dreams are more likely to report transformative/transcendent meditative experiences and fantasy daydreaming.

Instead of finding a relationship between narrowband mindfulness variables and lucid dreaming, the present study found a relationship among lucid dreaming and what Smith (2019) refers to as deeper levels of mindfulness. RMM Level 5, "Mindful Transformation/ Transcendence" includes individual RMM states, "Feeling REVERENT/PRAYERFUL," (RMM 20), "AWE/WONDER, DEEP MYSTERY of things beyond my understanding," (RMM 21), and "I felt a profound personally meaningful 'SPIRITUAL' or 'MYSTICAL' experience—sudden

awakening or insight," (RMM 22). These items are atypical of standard, narrowband mindfulness measures but are part of Smith's third-generation mindfulness theory because many advanced practitioners report these types of experiences frequently during meditation and in everyday life. Given that these theoretically deeper states of mindfulness predict lucid dreaming frequency, it is possible that lucid dreaming frequency is associated with levels of trait mindfulness developed through years of meditation and practice. However, causal relationships cannot be determined from this study.

Another surprising finding was lucid dreaming frequency's connection to item RMM 6, "Lost in FANTASY and DAYDREAMING." Fantasy and daydreaming are generally considered the antithesis of the goals of mindfulness; however, daydreaming is a common occurrence even among those who are expert meditators. This relationship is possibly influenced by personality characteristics related to Openness to Experience. Openness to experience is one of McCrae (1994)'s "Big Five" factors of personality, with high scorers described as imaginative, artistic, sensitive to their inner world, and adventurous and open-minded. Hess, Schredl, and Goritz (2017) recently found a positive relationship between lucid dreaming and openness to experience. It is possible that individuals who are more sensitive to inner experiences and open to adventurous endeavors may have a predisposition to lucid dreaming or otherwise develop an interest in it. Interestingly, there is a small body of research specifically linking lucid dreaming frequency to fantasy-proneness, a subset of Openness to Experience. Fantasy-proneness refers to the characteristic tendency to have a deep, long-standing involvement in fantasy or imagination (Lynn & Rhue, 1988). This is consistent with the findings of Schredl and Erlacher (2004), who found LD frequency was associated with two facets of openness, "fantasy" and "openness." Participants also scored high on specific dimensions within

openness to experience: thin boundaries, absorption, and imagination. Thin versus thick boundaries refers to a person's relative degree of closeness or separation between entities, processes, and functions in the mind (Hartmann, Elkin, & Garg, 1991). Individuals with thin boundaries tend to be trusting, sensitive, and emotionally vulnerable. Galvin (1990) studied lucid dreamers compared to nightmare sufferers and a control group, finding that lucid dreamers demonstrated thin boundaries compared to controls, and similarly thin boundaries but a more coherent sense of self than the nightmare suffers. Taken together, it may be interesting to consider the possibility that lucid dreaming, mindful transcendence, and fantasy are all a function of an individual's openness to experience.

It is important to note that we did not find the relationship between lucid dreaming and classical definitions of mindfulness that has been reported in the literature (Baird et al., 2018; Stumbyrs et al., 2015; Stumbrys & Erlacher, 2017). This could be due to sampling differences. Stumbrys et al. (2015) utilized the same restricted sample as Stumbyrs and Erlacher (2017), which included visitors to an internet lucid dreaming website. The individuals who frequent such a website are likely to demonstrate a unique set of personality characteristics and interests that may not be representative of the general population. Baird et al. (2018) used different measures of trait mindfulness, the Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006) and the Toronto Mindfulness Scale (TMS; Lau et al., 2006), which captured different dimensions of experience than the FMI and the RMMf. Their meditation-naïve group demonstrated only a relationship between lucid dreaming frequency and the Describing scale on the FFMQ. The Describing scale includes items such as, "I can easily put my beliefs, opinions, and expectations into words" and "I can usually describe how I feel at the moment in considerable detail." This aspect of the FFMQ is not directly addressed in either the FMI or the

RMMf. In Baird et al.'s (2018) study, the TMS's two factors of mindfulness, Curiosity and Decentering, and the FFMQ's Observing, Acting with Awareness, Nonjudging of Inner Experience, and Nonreactivity to Inner Experience dimensions did not significantly correlate with lucid dreaming frequency. This supports the findings of the present study, in that the narrowband dimensions commonly assessed as aspects of mindfulness did not significantly correlate with lucid dreaming. Rider (2012) also did not find a direct relationship between lucid dreaming and narrowband mindfulness questionnaires, but in a qualitative review noted higher degrees of meta-awareness and mindfulness in the dream and waking life content. It may be that greater degrees of waking mindfulness are associated with higher degrees of mindfulness in dream content, as opposed to greater lucidity and lucid dreaming frequency. The content of dreams and lucid dreams may be an area of interest for future research.

Prior studies also noted a relationship between meditation experience and lucid dreaming frequency (Baird et al, 2018; Stumbyrs et al., 2015). The present study assessed current meditation practice frequency and did not find a significant correlation with lucid dreaming frequency. This could be due to methodological and sampling differences. Baird et al. (2018) found significant meditation practice history over multiple years significantly correlated with lucid dreaming frequency, yet an 8week meditation course did not increase lucid dreaming frequency. They used a sample of highly experienced meditators who were required to have had at least 5 years of meditation experience averaging 200 minutes per week and 5 weeks experience in meditation retreats. This is likely not indicative of the average meditation practitioner but rather of a highly select, advanced practitioner. The present study asked about current meditation practice frequency but did not ask for years of experience with meditation, which may have been an important factor related to an individual's capacity for meta-awareness.

It is possible that higher degrees of meta-awareness associated with lucid dreaming may only develop after a significant amount of time is spent in meditation.

Studies that found a positive relationship between meditation and lucid dreaming also speculated into the nature of this relationship, questioning the causality between variables (Baird et al., 2018; Stumbrys et al., 2015). Researchers have wondered whether this relationship was likely due to another construct, such as meta-awareness, which is more difficult to assess through self-report means. A study by Zeidan, Johnson, Diamond, David, and Goolkasian (2010) found that brief (four 20-minute sessions over 4 days) mindfulness training improved cognition in a number of attentional and executive processing capacities. Meta-awareness and executive functioning are highly overlapping constructs (Fernandez-Duque, Baird, & Posner, 2000), which suggests that meta-awareness may also be increased through brief mindfulness interventions. Future research should examine the meta-awareness construct in greater detail to clarify the relationships between meditation and lucid dreaming.

Post-hoc analyses of meditation type indicated a difference between somatic and cognitive focus attention meditation type that approached significance in predicting lucid dreaming frequency. Those who primarily practiced cognitive meditation focused on a mental image or mantra reported more frequent lucid dreams than those who practiced somatic meditation focused on bodily sensation or breathing. Speculation about this relationship remains purely hypothetical, but it is possible that those who practice picturing certain images while meditating have a stronger ability to elicit images in sleep and dreaming than those who do not practice this skill.

The present study has implications for the self-report assessment of mindfulness. Classical measures are narrowband and tap one or two dimensions, typically presence,

awareness, and acceptance. A broadband assessment that includes the full spectrum of levels of experience related to mindfulness may be a useful supplement. The present study found that experiences related to transcendence, transformation, and fantasy (all mindfulness-related) are associated with lucid dreaming frequency. The RMMf specific broadband measure deployed here yields six general scales. However, the present study supports supplementary item-level analyses. Given that the assessment of mindfulness is still in its infancy, supplementary item-level analyses may prove to be fruitful as well.

Limitations

There are several limitations to this study. First, the self-report nature of the questionnaires limited the results and possibly influenced the outcome of certain assessments. Lucid dreaming frequency estimation across populations in self-report studies varies tremendously, with no clear reason why. However, there is a tendency for dreams to be underreported in self-report measures when compared to logbook methodologies (Aspy, Delfabbro, & Proeve, 2015). Therefore, lucid dreaming frequency may be a phenomenon best explored through other methodologies. Aspy et al. (2015) also argue that the retrospective self-report nature of dream recall questionnaires relies on meta-cognitive abilities and memory, which may be the cause of different study designs yielding meaningfully different results. Second, there were some weaknesses in the content and design of the questionnaires. The meditation practice history questionnaire design hindered comparisons to previous research, as years of experience with regular meditation was not asked. It was also unclear as to whether participants could select multiple types of regular meditation practices. The lucid dreaming questionnaire could have also incorporated more questions regarding lucid dreaming

experiences, including content and degree of volitional control, as these may provide a richer picture of this relationship than frequency alone.

Summary

The present study examined the relationships among mindfulness, lucid dreaming frequency, and meditation as experiences involving meta-awareness during waking and sleeping. Surprisingly, meditation and narrowband mindfulness assessments did not predict lucid dreaming frequency as previous studies have found. Rather, lucid dreaming frequency was primarily predicted by transcendent experiences and involvement in fantasy and daydreaming. These findings speak to the importance of using broadband mindfulness measures that assess for other facets of mindfulness, like transcendence and fantasy, outside of the traditional scales of presence, acceptance, and awareness. These results may also indicate that lucid dreaming is a function of personality characteristics like Openness to Experience and having thin boundaries, but future research is needed to determine the extent of these relationships.

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Appendix A

Demographics Questionnaire

You may choose to leave any item on this questionnaire blank.

1. **What is your age?** _____ years old

2. **What is your gender?**
   - ☐ Male
   - ☐ Female
   - ☐ _____

3. **What is your sexual orientation?**
   - ☐ Heterosexual/straight
   - ☐ Lesbian
   - ☐ Gay
   - ☐ Bisexual
   - ☐ Queer
   - ☐ Other: _____

4. **What is your racial/ethnic background?** (select all that apply)
   - ☐ American Indian
   - ☐ Asian
   - ☐ Black/African American
   - ☐ Hispanic/Latino
   - ☐ White/Caucasian
   - ☐ Other: _____

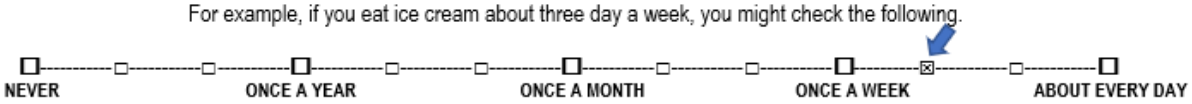
5. **What is your current highest level of education completed?**
   - ☐ Some high school
   - ☐ High school diploma / GED
   - ☐ Some college
   - ☐ Associates degree/technical degree
   - ☐ Bachelor's degree (BS, BA, or BFA), or four-year college degree equivalent
   - ☐ Master's degree
   - ☐ Doctoral degree

Appendix B

RMMf

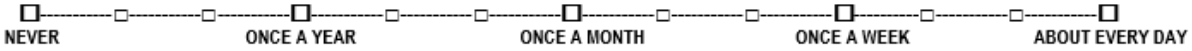
RELAXATION, MEDITATION, AND MINDFULNESS EXPERIENCES QUESTIONNAIRE

Below is a list of experiences sometimes associated with a variety of types of relaxation, meditation, and mindfulness.
(You need not practice an exercise or technique to have one of these experiences.)
How often (if ever) have you experienced each? Check one box (☐ or ▭) per item.
For example, if you eat ice cream about three day a week, you might check the following.

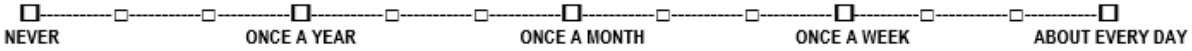


CHECK THE BOX ***CLOSEST*** TO YOUR ANSWER.

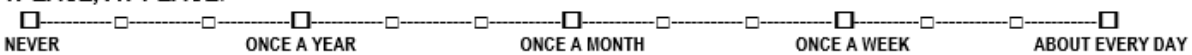
1. ***FAR AWAY*** *and distant from the troubles around me.* ***(Check the box closest to how often experienced)***



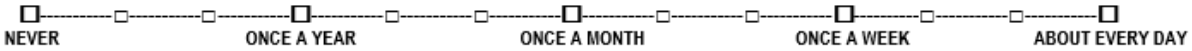
2. ***PHYSICALLY RELAXED***. *Muscles relaxed, loose, limp, warm and heavy. Breathing slow, even, and easy.*



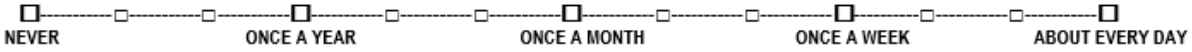
3. ***AT EASE, AT PEACE***.



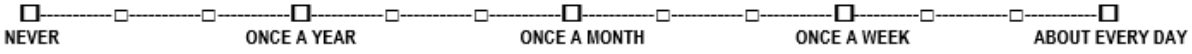
4. ***REFRESHED***.



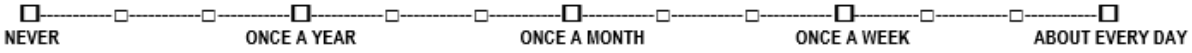
5. ***PLEASANT MIND WANDERING***. *Undirected, random positive thoughts.*



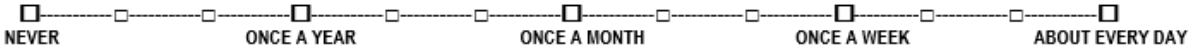
6. *Lost in* ***FANTASY*** *and* ***DAYDREAMING***.



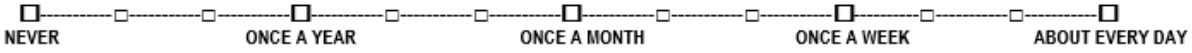
7. *Periods of sustained, continuous* ***FOCUS, ABSORPTION***.



8. ***CENTERED, GROUNDED.***

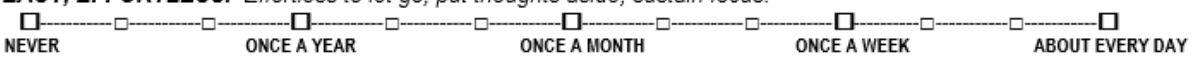


9. ***QUIET.*** *Still, few thoughts. Little mind wandering.*

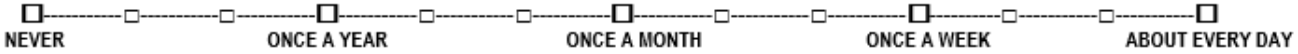


10. ***UNBOTHERED.*** *Accepting. When I had a negative thought or feeling, I didn't get caught up in it. No judging, clinging, pushing away, figuring things out.*

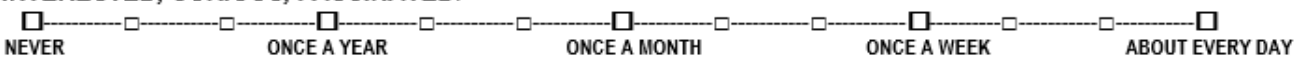
11. ***EASY, EFFORTLESS.*** *Effortless to let go, put thoughts aside, sustain focus.*



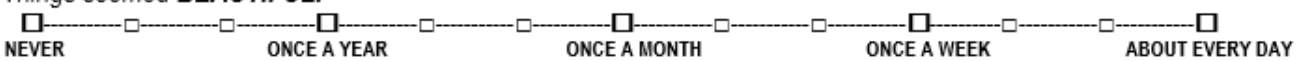
12. CLEAR, AWAKE, AWARE. *I saw things as they really are.*



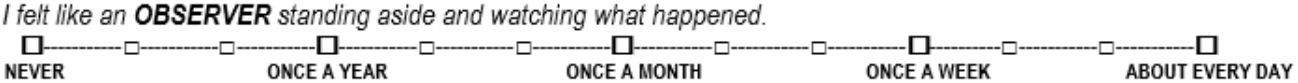
13. INTERESTED, CURIOUS, FASCINATED.



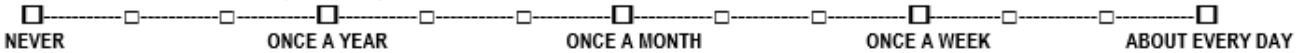
14. *Things seemed* **BEAUTIFUL.**



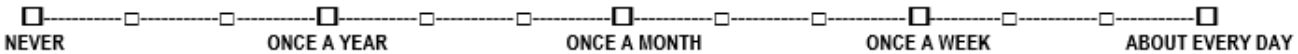
15. *I felt like an* **OBSERVER** *standing aside and watching what happened.*



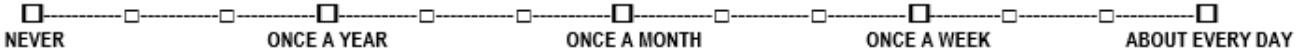
16. GOING DEEPER. *Things seemed unexpected, new, changing, opening up, being revealed. Felt like I was in a different place or space.*



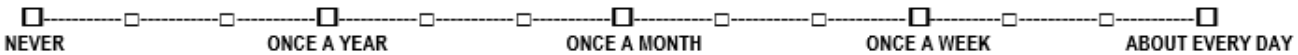
17. *Sense of* **SPACIOUSNESS, EXPANSIVENESS.**



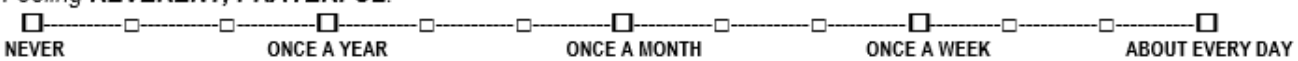
18. *I felt the* **SENSE OF SOMETHING GREATER** *than myself (God, higher power, spirit, energy, love, or consciousness.)*



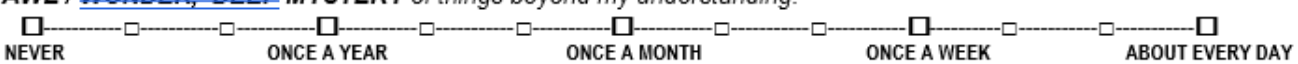
19. *A sense of* **MEANING, PURPOSE, DIRECTION.**



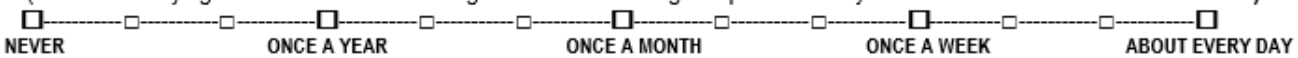
20. *Feeling* **REVERENT, PRAYERFUL**.



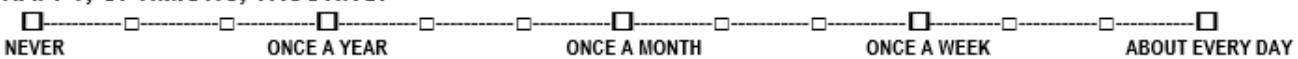
21. AWE / WONDER, DEEP MYSTERY *of things beyond my understanding.*



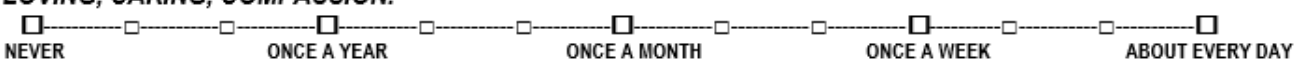
22. *I felt a profound personal meaningful "***SPIRITUAL***" or "***MYSTICAL***" experience -- sudden awakening or insight.*
(Felt an underlying hidden **TRUTH.** Feeling **AT ONE.** Feelings so profound they **COULD NOT BE PUT INTO WORDS.)**



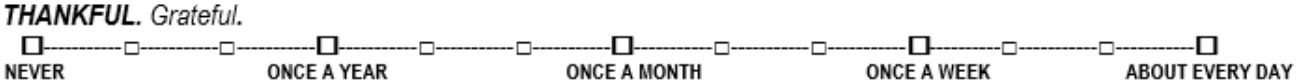
23. HAPPY, OPTIMISTIC, TRUSTING.



24. LOVING, CARING, COMPASSION.



25. THANKFUL. *Grateful.*



Appendix C

Meditation Experience and Frequency Questionnaire.

Do you have any experience with meditation? (See definition) Yes / No	
Definition: Meditation is any technique or exercise that involves quiet and sustained simple focus.	
If yes, how often do you meditate?	
	Score
Never	0
Less than once a month	1
About once a month	2
Twice or three times a month	3
About once a week	4
Several times a week	5
Almost every day	6

What type of meditation do you practice?		
Focused Attention- Somatic: *a focus on the body, such as breathing or noticing physical sensations*	Yes	No
Focused Attention- Cognitive: *mental focus on a mantra or mental image*	Yes	No
Open Monitoring: *Observing whatever phenomena pass through awareness without becoming overly involved in any one thought or experience*	Yes	No
Other (i.e. yoga, relaxation exercises, etc.): _____		

What type of meditation do you practice most?		
Focused Attention- Somatic: *a focus on the body, such as breathing or noticing physical sensations*	Yes	No
Focused Attention- Cognitive: *mental focus on a mantra or mental image*	Yes	No
Open Monitoring: *Observing whatever phenomena pass through awareness without becoming overly involved in any one thought or experience*	Yes	No
An Even Mix of Types	Yes	No

Appendix D

Dream Recall Frequency Questionnaire.

How often do you remember your dreams?	
	Score
Never	0
Less than once a month	1
About once a month	2
Twice or three times a month	3
About once a week	4
Several times a week	5
Almost every morning	6

Appendix E

Lucid Dreaming Frequency Questionnaire.

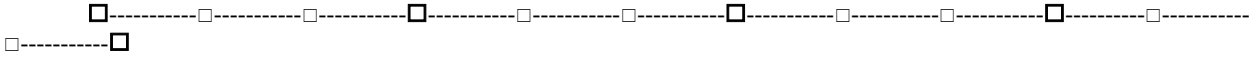
Have you ever experienced a lucid dream? (See definition) Yes / No	
Definition: Lucid dreaming is when you are aware that you are dreaming during the dream. In a lucid dream, you may be simply aware that you are dreaming, or you may be able to control the dream.	
How often do you experience lucid dreams?	
	Score
Never	0
Less than once a year	1
About once a year	2
About 2-4 times a year	3
About once a month	4
About 2-3 times a month	5
About once a week	6
Several times a week	7

Appendix F

Scoring for the RMMf.

RMMf scores were entered according to this scale: RAW SCALE SCORES

0 1 2 3 4 5 6 7 8 9 10 11 12



NEVER ONCE A YEAR ONCE A MONTH ONCE A WEEK ABOUT EVERY DAY

Scoring

For research requiring fewer dimensions, I recommend scoring for scales 1, 3, 6, and 7.

1. BASIC MINDFUL RELAXATION
ADD SCORES FOR THE FOLLOWING, DIVIDE BY 4
- FAR AWAY
- PHYSICALLY RELAXED
- AT EASE, AT PEACE
- REFRESHED

2. BASIC MINDFULNESS: FOCUS
ADD SCORES FOR THE FOLLOWING, DIVIDE BY 2
- FOCUS, ABSORPTION
- CENTERED, GROUNDED

3. BASIC MINDFULNESS: QUIET
ADD SCORES FOR THE FOLLOWING, DIVIDE BY 3
- QUIET
- UNBOTHERED
- EASY, EFFORTLESS

4. MINDFUL AWAKENING (*a priori from my theory*)
ADD SCORES FOR THE FOLLOWING, DIVIDE BY 4
- CLEAR, AWAKE, AWARE
- INTERESTED, CURIOUS, FASCINATED
- BEAUTIFUL
- OBSERVER

5. MINDFUL DEEPENING (a priori from my theory)
ADD SCORES FOR THE FOLLOWING, DIVIDE BY 4
- GOING DEEPER
- SPACIOUSNESS, EXPANSIVENESS
- SENSE OF SOMETHING GREATER
- MEANING, PURPOSE, DIRECTION

6. MINDFUL TRANSCENDENCE
ADD SCORES FOR THE FOLLOWING, DIVIDE BY 3
- REVERENT, PRAYERFUL
- AWE/WONDER, DEEP MYSTERY
- SPIRITUAL, MYSTICAL

7. MINDFUL POSITIVE EMOTION
ADD SCORES FOR THE FOLLOWING, DIVIDE BY 3
- HAPPY, OPTIMISTIC, TRUSTING
- LOVING, CARING, COMPASSION
- THANKFUL

EXPLORATORY DIMENSIONS

1. PLEASANT MIND WANDERING
   - PLEASANT MIND WANDERING

2. SIMPLY USE RAW SCORE
   - FANTASY DAYDREAMING

Derivation and interpretation of these scores are explained in my book

Smith, Jonathan C. (2017). *Stress and Coping: The Eye of Mindfulness*. Dubuque, IO: Kendall Hunt
https://he.kendallhunt.com/product/stress-and-coping-eye-mindfulness

For latest on my research, check my webpage:
https://blogs.roosevelt.edu/jsmith/

Appendix G

N, Mean, and Standard Deviation, for RMMf Items

RMMf Item	*N*	Mean	*SD*
RMM 1: Far Away	209	7.42	3.33
RMM 2: Physically Relaxed	215	9.16	2.85
RMM 3: At Ease, At Peace	215	9.07	2.60
RMM 4: Refreshed	214	8.85	2.48
RMM 5: Pleasant Mind Wandering	216	9.79	2.21
RMM 6: Fantasy and Daydreaming	206	9.50	2.66
RMM 7: Focus, Absorption	214	9.84	2.50
RMM 8: Centered, Grounded	216	9.56	2.46
RMM 9: Quiet	216	8.60	3.11
RMM 10: Unbothered	216	8.37	2.93
RMM 11: Easy, Effortless	216	8.61	2.85
RMM 12: Clear, Awake, Aware	215	10.07	1.88
RMM 13: Interested, Curious, Fascinated	216	10.74	1.68
RMM 14: Beautiful	215	9.93	2.46
RMM 15: Observer	213	8.78	3.23
RMM 16: Going Deeper	214	8.23	2.82
RMM 17: Spaciousness, Expansiveness	211	7.78	2.80
RMM 18: Sense of Something Greater	216	8.34	3.83
RMM 19: Meaning, Purpose, Direction	215	9.07	2.94
RMM 20: Reverent, Prayerful	214	7.23	4.17
RMM 21: Awe/ Wonder, Deep Mystery	214	8.86	3.02
RMM 22: “Spiritual” or “Mystical,”	211	6.52	3.93
RMM 23: Happy, Optimistic, Trusting	216	9.49	2.58
RMM 24: Loving, Caring, Compassion	216	10.79	1.86
RMM 25: Thankful	216	10.72	1.95

Appendix H

N, Mean, Standard Deviation, and Cronbach's Alpha for Main Study Variables

Variable	*N*	Mean	Standard Deviation	Cronbach's α
Lucid Dreaming Frequency	217	2.82	2.30	-
Meditation Practice Frequency	217	2.81	2.25	-
FMI- total score	214	39.72	6.20	.806
FMI- Presence	214	18.24	2.59	.585
FMI- Acceptance	217	16.53	4.22	.743
Level 1: Mindful Basic Relaxation	206	8.57	2.00	.659
Level 2: Mindful Quiet Focus	214	8.98	2.05	.792
Level 2a: Basic Mindfulness: Focus	214	9.69	2.13	.639
Level 2b: Basic Mindfulness: Quiet	216	8.53	2.52	.809
Level 3: Mindful Awakening	212	9.90	1.58	.575
Level 4: Mindful Deepening	211	8.35	2.32	.732
Level 5: Mindful Transformation/ Transcendence	211	7.54	3.08	.767
+1: Mindful Transcendent Positive Emotion	216	10.33	1.83	.808
RMM 6: Fantasy	216	9.50	2.21	-

Appendix I

Summary of intercorrelations for all study variables

Measures	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. RMM 1 Far Away		.16**	.22**	.18**	.20**	.04	.05	.14*	.21**	.26**	.20**	.08	.10	.20**	.25**
2. RMM 2 Physically Relaxed			.53**	.45**	.40**	.10	.32**	.37**	.29**	.38**	.34**	.33**	.21**	.43**	.14*
3. RMM 3: At Ease, At Peace				.61**	.45**	.10	.22**	.48**	.37**	.46**	.49**	.27**	.23**	.45**	.19**
4. RMM 4: Refreshed					.36**	.064	.31**	.53**	.38**	.36**	.43**	.41**	.18**	.42**	.12
5. RMM 5: Pleasant Mind Wandering						.14*	.35**	.43**	.17*	.36**	.37**	.31**	.26**	.50**	.23**
6. RMM 6: Fantasy and Daydreaming							.15*	-.03	-.03	.08	.05	-.02	.02	.04	.20**
7. RMM 7: Focus, Absorption								.47**	.20**	.29**	.38**	.31**	.32**	.29**	.14*
8. RMM 8: Centered, Grounded									.35**	.44**	.44*	52**	.31**	.46**	.20**
9. RMM 9: Quiet										.54**	.51**	.29*	.23**	.10	.27*
10. RMM 10: Unbothered											.72**	.35**	.29**	.36**	.36**
11. RMM 11: Easy, Effortless												.40**	.33**	.32**	.25**
12. Clear, Awake, Aware													.34**	.41**	.15*
13. RMM 13: Interested, Curious, Fascinated														.48**	.12
14. RMM 14: Beautiful															.27**

* = $p \leq 0.05$
** = $p \leq 0.01$

Measures	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16. RMM 16: Going Deeper	.12	.23**	.28**	.18**	.31**	.17*	.16*	.17*	.31**	.28**	.19**	.23**	.17*	.38**	.53**
17. RMM 17: Spaciousness, Expansiveness	.21**	.38**	.39**	.32**	.36**	.05	.21**	.31**	.35**	.33**	.34**	.26**	.22**	.44**	.32**
18. RMM 18: Sense of Something Greater	.10	.23**	.19**	.23**	.19**	.03	.21**	.20**	.19**	.13	.13	.17*	.13	.28**	.20**
19. RMM 19: Meaning, Purpose, Direction	.16*	.21**	.27**	.41**	.34**	.06	.34**	.41**	.25**	.25**	.30**	.45**	.27**	.48**	.18*
20. RMM 20: Reverent, Prayerful	.14*	.22**	.28**	.30**	.24**	-.047	.19**	.20**	.28**	.20**	.27**	.18**	.09	.24**	.08
21. RMM 21: Awe/ Wonder, Deep Mystery	-.029	.13	.16*	.21**	.26**	.11	.18**	.16*	.17*	.12	.12	.17*	.27**	.25**	.11
22. RMM 22: “Spiritual” or “Mystical”	.07	.23**	.19**	.27**	.26**	-.01	.15*	.17*	.21**	.21**	.21**	.21**	.17*	.29**	.17*
23. RMM 23: Happy, Optimistic, Caring	.20**	.31**	.46**	.45**	.50**	-.00	.34**	.48**	.30**	.40**	.41**	.30**	.35**	.60**	.18**
24. RMM 24: Loving, Caring, Compassion	.07	.15*	.26**	.38**	.32**	-.08	.28**	.34**	.14*	.22**	.25**	.26**	.35**	.47**	.11
25. RMM 25: Thankful	.13	.18**	.26**	.39**	.30**	.05	.31**	.31**	.22**	.33**	.38**	.38**	.33**	.56**	.19**
26. FMI-Total	.12	.27**	.37**	.39**	.38**	-.05	.34**	.42**	.28**	.43**	.46**	.36**	.30**	.42**	.17*
27. FMI - Acceptance	.13	.29**	.39**	.38**	.37&&	-.03	.29**	.39**	.29**	.46**	.46**	.30**	.28**	.42**	.21**
28. FMI - Presence	.08	.18**	.28**	.32**	.31**	-.06	.33**	.38**	.22**	.30**	.34**	.36**	.26**	.31**	.07
29. Lucid Dreaming Frequency	.08	.05	.02	.04	.12	.17*	.04	.02	.07	.14*	.21*	.15*	.10	.02	.07
30. Meditation Practice Frequency	.19**	.38**	.36**	.37**	.24**	-.06	.20**	.28**	.25**	.25**	.23**	.17*	.19*	.35**	.13

* = $p \leq 0.05$
** = $p \leq 0.01$

Measures	17	18	19	20	21	22	23	24	25	26	27	28	29	30
16. RMM 16: Going Deeper	.61**	.36**	.29**	.27**	.36**	.46**	.24**	.10	.24**	.19**	.18**	.19**	.14*	.27**
17. RMM 17: Spaciousness, Expansiveness		.34**	.36**	.35**	.43**	.47**	.34**	.22**	.27**	.40**	.38**	.33**	.19**	.360**
18. RMM 18: Sense of Something Greater			.56**	.69**	.48**	.62**	.29**	.21**	.40**	.27**	26**	.20*	.19**	.34**
19. RMM 19: Meaning, Purpose, Direction				.48**	.42**	.43**	.50**	.38**	.55**	.46**	.45**	.37**	.18**	.27**
20. RMM 20: Reverent, Prayerful					.44**	.61**	.33**	.22**	.39**	.29**	.31**	.21**	.22**	.35**
21. RMM 21: Awe/ Wonder, Deep Mystery						.53**	.25**	.17**	.27**	.30**	.25**	.31**	.22**	.23**
22. RMM 22: "Spiritual" or "Mystical"							.31**	.16*	.33**	.31**	.32**	.24**	.24**	.35**
23. RMM 23: Happy, Optimistic, Caring								.64**	.55**	.50**	.49**	.40**	.13	.22**
24. RMM 24: Loving, Caring, Compassion									.63**	.41**	.37**	.38**	-.04	.07
25. RMM 25: Thankful										.38**	.36**	.31**	.12	.22**
26. FMI- Total											.95**	.85**	.10	.30**
27. FMI - Acceptance												.64**	.11	.33**
28. FMI - Presence													.07	.20**
29. Lucid Dreaming Frequency														.07
30. Meditation Practice Frequency														

* = $p \leq 0.05$
** = $p \leq 0.01$

Appendix I

Summary of intercorrelations for main study variables

Measures	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Lucid Dreaming Frequency		.073	.104	.066	.109	.078	.037	.163*	.105	.244**	.273**	.087	.117	.173*	.142*
2. Meditation Frequency			.303**	.202**	.325**	.431**	.276**	.283**	.299**	.409**	.383**	.203**	.243**	-.056	.314**
3. FMI- Total				.851**	.947**	.385**	.442**	.455**	.443**	.430**	.366**	.508**	.382**	-.050	.514**
4. FMI—Presence					.636**	.279**	.408**	.336**	.343**	.347**	.300**	.427**	.310**	-.063	.408**
5. FMI—Acceptance						.401**	.398**	.469**	.444**	.418**	.357**	.483**	.373**	-.034	.509**
6. Basic Mindful Relaxation							.458**	.582**	.497**	.447**	.314**	.423**	.468**	.136	.609**
7. Basic Mindfulness: Focus								.473**	.508**	.377*	.242**	.474**	.447**	.078	.762**
8. Basic Mindfulness: Quiet									.512**	.375**	.292**	.412**	.346**	.042	.931**
9. Mindful Awakening										.563**	.311**	.553**	.457**	.123	.583**
10. Mindful Deepening											.749**	.471**	.391**	.141*	.431**
11. Mindful Transformation/ Transcendence												.396**	.304**	.010	.313**
12. Mindful Positive Emotion													.452**	-.009	.495**
13. Mind Wandering (RMM 5)														.140*	.434**
14. Fantasy (RMM 6)															.080
15. Mindful Quiet Focus															

* = $p \leq 0.05$
** = $p \leq 0.01$

Appendix H

Manuscript to be Submitted for Publication: Mindfulness, Meditation, and Lucid Dreaming

Chelsea Geise, MA and Jonathan C. Smith, PhD [Provisional authorship]

Abstract

Mindfulness involves being aware of one's thoughts and surroundings, attending to them in a conscious, intentional way. Lucid dreaming is similar in that it is a type of dreaming in which dreamers are aware and conscious of the fact that they are dreaming. Both appear to involve metacognition and awareness, or "awareness of awareness" in which the subject is aware and consciously attending to present experiences. Despite evidence to support the continuity hypothesis of dreaming (that posits a connection and continuation of sleeping and waking cognitions), little research has explored a relationship between lucid dreaming and waking mindfulness. The purpose of the present study was to clarify the relationship between mindfulness, lucid dreaming, and meditation experience, as engaging in meditative exercises has been closely linked to both mindfulness and lucid dreaming. A sample of undergraduate students and meditators completed questionnaires related to mindfulness, lucid dreaming frequency, and meditation practices. Surprisingly, lucid dreaming was not associated with narrowband mindfulness concepts like presence, acceptance, and awareness. Intercorrelations and multiple regression analyses indicated that lucid dreaming frequency was predicted only by potentially mindfulness-related experiences of Fantasy and Transcendence. Lucid dreaming frequency was also unrelated to meditation practice frequency.

Introduction

Mindfulness has been defined in a variety of ways. Perhaps the most widely cited is Kabat-Zinn's (1994, 2003) secular definition "Paying attention, or the awareness that arises through paying attention on purpose, in the present moment, and nonjudgmentally; with an affectionate, compassionate quality, a sense of openhearted friendly presence and interest."

Dozens of similar secular definitions have been offered. However, Baer et al. (2019) have proposed that most include two general elements: paying attention to the present moment (the "what" of mindfulness) and various "qualities" of attention (the "how" of mindfulness; openness, nonjudgment, acceptance, friendliness, curiosity, kindness, and compassion). Of these qualities, nonjudgmental acceptance is perhaps most frequently noted.

Smith (2019) has proposed that such definitions are narrowband in that they focus primarily on awareness and often nonjudgmental acceptance. In contrast, Smith (2019) has offered a complex broadband definition. Unlike Baer et al. he identifies both attentional focus and nonjudgmental acceptance as central:

> *Mindfulness is sustained simple focus; Awareness of the present moment as it is with minimal distracting judgment, tension/effort, and thought (Smith, 2019).*

Whereas Baer et al. (2019) have identified a handful of loosely selected states identified as "qualities" of awareness, Smith places such qualities as part of a broader hierarchy of mindfulness-related states. all of which involve a degree of sustained focus and minimal judgment, tension/effort, and thought. Specifically, he proposes 25 specific interrelated RMM (relaxation/meditation/ mindfulness) states organized into "5+1" levels: Mindful Basic Relaxation, Mindful Quiet Focus, Mindful Awakening, Mindful Deepening, Mindful Transformation / Transcendence, and Mindful Transcendent Positive Emotion. His model is supported by 31 published factor analytic

studies involving over 6,000 participants practicing three dozen f relaxation, meditation, and mindfulness-related techniques and activities (Smith 2019). Further elaboration of this perspective is beyond the scope of this article. However, it is important to note that Smith has recommend supplementing narrowband assessments emphasizing attention/awareness and nonjudgmental acceptance with broadband measures that tap a full spectrum of related RMM states.

Lucid dreaming involves being aware of ones dream during the dream, possibly exerting direction and control over the dream. About 55% of people have experienced one or more lucid dreams in their lifetime, and 23% at least once a month (Saunders et al., 2016). Not much is known about the circumstances or functions of lucid dreaming. However, it appears that frequent lucid dreamers tend to demonstrate high internal locus of control and openness to experience with low agreeableness (Blagrove and Hartnell, 2000; Hess, Schredl, and Goritz, 2017). They also tend to portray dominant, socially bold, experimenting, enthusiastic, and warm traits (Gruber, Steffen, & Vonderhaar, 1995). Lucid dreamers also tend to be more assertive and self-confident than rare- or non-lucid dreamers (Doll, Gittler, & Holzinger, 2009). It is theorized that lucid dreaming can operate as an arena for problem-solving and decision-making that can facilitate more effective processing and coping in waking life (Doll, Gittler, & Holzinger, 2009; LaBerge, 1985).

Mindfulness and lucid dreaming (LD) can be viewed as variants of secondary consciousness. Secondary consciousness is a type of self-reflective awareness, or metacognition, in which the person is aware of what they are doing or thinking (Hobson, 2009). This type of higher order thinking requires greater cognitive ability than primary consciousness, which refers to the simple perception and emotion exhibited by most mammals.

Primary and secondary consciousness experiences occur during both wakefulness and sleep. For instance, wakeful primary consciousness experiences include mind-wandering (e.g., unintentionally shifting attention from a presentation to what is for dinner) and automatic behaviors (e.g., driving somewhere routinely with little memory of the drive), whereas in sleep, these experiences consist of dreams that the dreamer is unable to influence. In wakeful awareness, one may display secondary consciousness spontaneously as self-awareness. Secondary consciousness is also associated with mindfulness and certain types of meditative practices.

In sleep, lucid dreaming is considered a secondary consciousness experience because the dreamer is aware of the fact that they are dreaming and can exert some control over their experience. Research has demonstrated the health benefits of practicing mindfulness exercises as a means of developing mindfulness states (Brown, Marquis, & Guiffrida, 2013). Specifically, mindfulness interventions have resulted in improvements in mental well-being and a reduction in mind-wandering and rumination (Evans & Segerstrom, 2010; Keng, Smoski, & Robins, 2011; Keune, Bostanov, Kotchoubey, & Hautzinger, 2012; Mrazek, Franklin, Phillips, Baird, & Schooler, 2013). In addition, research suggests that lucid dreaming may facilitate problem-solving and emotion regulation (Doll, Gittler, & Holzinger, 2009). It has also been applied in several pilot studies as a treatment for nightmare reduction in PTSD populations (Spoormaker, 2006).

Stumbrys (2011) has hypothesized a relationship between dream lucidity and waking mindfulness based on the continuity hypothesis. However, Rider (2012) did not find a significant relationship between dream lucidity and waking mindfulness, but the data did indicate that a higher degree of mindfulness in dream content was associated with increased waking

mindfulness. Stumbyrs, Erlacher, and Malinowski (2015) found lucid dreaming was correlated with dispositional mindfulness; however, this effect was only found in those who practice meditation. The main predictors of greater lucid dream control were higher lucid dream frequency and waking dispositional mindfulness, as well as younger age (Stumbrys & Erlacher, 2017). Baird et al. (2018) then assessed the effects of an 8-week MBSR course on a self-report scale of lucid dreaming frequency (Schredl & Erlacher, 2004) and measured trait mindfulness using the Toronto Mindfulness Scale (TMS; Lau et al., 2006) and the Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006, 2008).

Participants were divided into meditation-naïve individuals who did not have significant training in meditation and long-term meditators. Long-term meditators have more frequent lucid dreams, whereas general dream recall frequency was not significantly different between groups. Across the entire sample, frequent lucid dreamers (anyone who had more than 1 lucid dream per month), demonstrated greater ability to describe their experiences, as indicated by the Describing subscale of the FFMQ. Within the long-term meditator subgroup, those with more frequent lucid dreams reported higher scores for Observing and Acting with Awareness subscales of the FFMQ and the Decentering subscale of the TMS. Within the meditation naïve subgroup, frequent lucid dreamers had higher Describing scales on the FFMQ, with no other significant differences. Following the 8-week mindfulness course, researchers found no increase in lucid dreaming frequency and no change compared to a nonmeditation control group.

INCORPORATE THE FOLLOWING CONTENT, SLIGHTLY EDITING.

sampling from a lucid dreaming community that had greater likelihood of experiencing lucid dreams. Stumbyrs, Erlacher, and Malinowski (2015) studied the relationship between lucid

dreaming, meditation, and mindfulness via an online survey of 528 individuals aged 11-67 who were recruited from a lucid dreaming website. Researchers found that lucid dreaming was in fact correlated with dispositional mindfulness; however, this effect was no longer significant when controlling for meditation practice. Mindfulness was significantly correlated with lucid dreaming frequency in those who meditated, but not for participants who indicated high degrees of mindfulness without meditation practice. This study also demonstrated several methodological issues, one being the use of the Freiberg Mindfulness Inventory (FMI; Walach et al., 2006) yielding a single-factor mindfulness score. Given the diverse range of experiences that can be associated with mindfulness, using a single-factor score may miss important mindfulness factors that are in fact related to lucid dreaming. This study also used a homogenous sample of lucid dreamers, which may have limited the possibility of finding patterns (Stumbrys et al., 2015). Those who seek out a lucid dreaming website are likely to be a unique group of individuals who already have an interest in this area. Furthermore, the study lacked participants who do not experience lucid dreams as a control group.

In sum, research on the relationship between mindfulness and lucid dreaming has yielded promising yet inconsistent results. Two frequent limitations are the use of narrowband measures of mindfulness that tap one or two dimensions (attention/awareness and nonjudgmental acceptance), select samples not representative of the general population.

The present study hypothesizes that a broadband measure of mindfulness will account more of the variance of lucid dreaming frequency than a narrowband measure. In addition, we hypothesized that individuals who report greater frequencies of meditation practice will report greater lucid dreaming frequency and that meditation practice history and mindfulness variables together will predict greater lucid dreaming frequency than either variable alone.

Methods

Participants

Participants were at least 18 years old (M = 31.71 years, sd = 17.82) Participants included undergraduate students (n = 150) and meditators at private institutions across Chicago that promote and teach mindfulness and meditation-related practices such as Tai Chi, yoga, peace breathing, and silent mindfulness meditation (n = 71). Sixty-four participants (29.5%) were male, 152 were female (70%), and 1 participant identified as "Other." Participants were primarily heterosexual (79.3%). Twenty-three participants identified as bisexual (10.6%), 6 identified as gay, 4 as queer, 4 as lesbian, 5 as Other, and 3 declined to answer. Participants racially and ethnically identified as White (52.5%), Hispanic (19.4%), African American (11.5%), Multiracial/Other (9.7%), and Asian (6.9%). A total of 221 participants completed the questionnaires; however, only 217 participants were included in the final analyses due to 4 participants' careless answering or multiple full questionnaires left blank. Participants were required to be proficient in English and have the ability to read English to participate.

Measures

Dispositional Mindfulness. To assess the participant's dispositional mindfulness, each participant was administered the Freiberg Mindfulness Inventory (FMI) and the Relaxation, Meditation, and Mindfulness Experiences Questionnaire trait version (RMMf). The FMI consists of 14 items scored on a 4-point scale (1 = rarely; 2 = occasionally; 3 = fairly often; 4 = almost always), with higher scores indicating greater levels of mindfulness (Walach et al., 2006). The FMI is a single-factor test with good reliability (Cronbach's alpha = .86; N = 243; Walach et al., 2006). The reliability of the single-factor FMI score in the present study was good

(Cronbach's alpha = .81). Stumbrys et al. (2015) used an alternative two-factor solution initially proposed by Kohls et al. (2009) with subscales of Presence and Acceptance. This two-factor solution for Presence and Acceptance demonstrated acceptable reliability for Stumbrys et al. (2015; Cronbach's alpha: .68 and .75, respectively; $N = 528$) as well as for Kohls et al. (2009; .69 and .77, respectively; $N = 241$). In the present study, the Cronbach's alpha coefficients for the two-factor solution were questionable: .59 for Presence and .73 for Acceptance. The present study used both the one and two-factor solutions to permit direct comparison to the findings of Stumbrys et al. (2015).

The RMMf is a 25-item self-report questionnaire that asks participants to rate how often they have experienced each of the 25 RMM States on a 12-point scale from "Never," to "About every day." The FMI traditionally yields one score of mindfulness. Together with the FMI, these measures provided a broadband (RMMf) and narrowband (FMI) assessment of mindfulness experience. Chronbach's alphas for each of the dimensions are in the .70's.

Meditation practice history. Participant's history of meditation practice was assessed using a questionnaire developed by Stumbrys et al. (2015). Participants were asked if they have any experience with meditation (yes/no), and if they had, how often they currently meditate and what kind of meditation they practice. Consistent with previous research, a simple definition of meditation was provided: "Meditation is any practice where you focus your mind on a particular object, thought or activity to achieve a mentally clear and emotionally calm state." Participants' responses for meditation practice history yielded a discrete categorical variable of practice with meditation (yes/no) as well as a continuous variable of meditation practice history on a 7-point Likert scale (0 = never; 1 = less than once a month; 2 = about once a month; 3 = twice or three times a month; 4 = about once a week; 5 = several times a week; and 6 = almost every morning).

Participants were also allowed to choose what type of meditation they practice (i.e., FAs, FAc, or OM) with definitions of each.

Dreaming and lucid dreaming frequency. Participants were asked to estimate their dream recall frequency using a 7-point scale based on one developed by Schredl (2004). The Schredl scale has demonstrated high retest reliability ($r = 85$; $p < .001$; and $N = 198$). The scale asks how often the participants remember their dreams and can respond 0 = never, 1 = less than once a month, 2 = about once a month, 3 = twice or three times a month, 4 = about once a week, 5 = several times a week, and 6 = almost every morning (see Appendix D). This questionnaire was included to ensure that lucid dreaming frequency is not merely a function of dream recall frequency.

Participants were then asked to answer (yes/no) if they have experienced a lucid dream. A simple definition of lucid dreaming was provided to ensure clarity and continuity of experience. The question asked, "Have you ever experienced a lucid dream? Lucid dreaming is when you are aware that you are dreaming during the dream. In a lucid dream, you may simply be aware that you are dreaming, or you may be able to control the dream." If the participant answered affirmatively, lucid dream frequency was assessed on a 7-point Likert scale similar to the dream recall frequency scale, where 0 = never; 1 = less than once a year; 2 = about once a year; 3 = about 2 to 4 times a year; 4 = about once a month; 5 = about 2 to 3 times a month; and 6 = about once a week; 7 = several times a week. The present scale was fashioned on Stumbrys' scale ("In a lucid dream, one is aware that one is dreaming during the dream. Thus it is possible to wake up deliberately, or to influence the action of the dream actively, or to observe the course of the dream passively;" p. 419). Stumbrys' scale has demonstrated high retest reliability ($r = .89$; $p < .001$; and $N = 93$; Stumbrys, Erlacher, & Schredl, 2013a). The lucid dreaming variable

was analyzed as a continuous variable using the 7-point Likert scale developed by Stumbrys et al. (2015).

Procedure

Participants included undergraduate students and mindfulness meditation practitioners from a variety of Chicago mindfulness and mindfulness-related programs. Researchers obtained written approval from each institution to recruit participants and written consent was then obtained from each participant. Participation in the study was not a prerequisite for participating in any of the services offered at any of the institutions either at that time or at any point in the future. Participants were allowed to withdraw their consent at any time without consequence and discontinue participation in the study. Once participants were informed of the study and consented to participate, they were given the FMI, RMMf, and questionnaires on demographic information, lucid dreaming frequency, and meditation practices.

Results

Pearson correlation coefficients (r) for all study variables are located in Table X. Dream recall frequency was not significantly correlated with any mindfulness variables, with the exception of RMM6 Fantasy ($r = .220$, $p = .001$). Therefore, it appears that lucid dreaming frequency was not associated with simple dream recall. All RMMf variables, with the exception of the exploratory RMM state 6 Fantasy, correlated ($p < .01$) with the FMI total score and two factors, Presence and Acceptance. Hypothesis 1, which postulated that individuals who endorse greater degrees of mindfulness will endorse greater lucid dreaming frequency, was partially supported. Specific RMM variables of Basic Mindfulness—Quiet, Mindful Deepening, Mindful Transformation/ Transcendence, and RMM 6 Fantasy—significantly correlated with higher lucid

dreaming frequency. Notably, neither the total FMI score or either of the two FMI factors, Presence and Acceptance, significantly correlated with lucid dreaming frequency. Hypothesis 2, that individuals who endorse greater frequencies of meditation practice will endorse greater lucid dreaming frequency, was not supported, $r = 0.073$, $n = 217$, $p = 0.286$. Hypothesis 3, that specific RMM dimensions correlate with meditation practice history, was supported. All FMI scores and RMMf variables, with the exception of RMM 6 Fantasy, significantly correlated with meditation practice (see Appendix X).

Summary of descriptive statistics for main study variables

Variable	*N*	Mean	Standard Deviation
Lucid Dreaming Frequency	217	2.82	2.30
Meditation Practice Frequency	217	2.81	2.25
FMI- total score	214	39.72	6.20
FMI- Presence	214	18.24	2.59
FMI- Acceptance	217	16.53	4.22
Level 1: Mindful Basic Relaxation	206	8.57	2.00
Level 2: Mindful Quiet Focus	214	8.98	2.05
Level 2a: Basic Mindfulness: Focus	214	9.69	2.13
Level 2b: Basic Mindfulness: Quiet	216	8.53	2.52
Level 3: Mindful Awakening	212	9.90	1.58
Level 4: Mindful Deepening	211	8.35	2.32
Level 5: Mindful Transformation/ Transcendence	211	7.54	3.08
+1: Mindful Transcendent Positive Emotion	216	10.33	1.83
RMM 6: Fantasy	216	9.50	2.21

Correlations between RMM Dimensions, FMI Factors, and Lucid Dreaming Frequency.

Measures	Lucid Dreaming Frequency	Meditation Practice Frequency
Meditation Practice Frequency	.073	--
FMI—total	.104	.303**
FMI—Presence	.066	.202**
FMI—Acceptance	.109	.325**
RMMf Basic Mindful Relaxation	.078	.431**
RMMf Basic Mindfulness: Focus	.037	.276**
RMMf Basic Mindfulness: Quiet	.163*	.283**
RMMf Mindful Awakening	.105	.299*
RMMf Mindful Deepening	.244**	.409**
RMMf Mindful Transformation/ Transcendence	.273**	.383**
RMMf Mindful Positive Emotion	.087	.203**
RMMf Mind Wandering (RMM 5)	.117	.243**
RMMf Fantasy (RMM 6)	.173*	-.056
RMMf Mindful Quiet Focus	.142*	.314**

* = $p \leq 0.05$
** = $p \leq 0.01$

Regression

We conducted several multiple regressions to clarify the relationships between lucid dreaming frequency, trait mindfulness, and meditation practice history. Only variables that correlated with significance $p \leq .05$ were included in the regression model. Although none of the

FMI scores, single factor or two-factor, survived this threshold, the two-factor scores were included in the stepwise regression nonetheless for comparison to previous studies. In sum, we included 4 predictor variables in the regression model: Basic Mindfulness: Quiet, Mindful Deepening, Mindful Transformation/ Transcendence, and RMM 6 Fantasy. It is important to note that the normality of residuals with Lucid Dreaming Frequency were not evenly distributed. This violates one of the assumptions of the multiple regression test. However, because regression analyses are fairly robust to violations of normality assumptions, we continued with the analyses knowing that the analysis may not capture the full extent of the relationship.

The first step of the stepwise regression regressed LD scores on the two factors of the FMI: Presence and Acceptance. Despite the correlations being nonsignificant, these were included in the model to compare to previous studies and to address Hypothesis 3. The second step regressed lucid dreaming frequency on the RMMf variables. The first regression solution was not significant, $F(2, 203) = 1.053$, $p = .351$, with an R^2 of 0.01. The second regression was significant, $F(6, 199) = 3.654$, $p = .002$, with an R^2 of .099. Approximately 9.9% of the variance in lucid dreaming frequency was explained by the independent variables outlined in Table . Upon examining the main effects, L5 Mindful Transformation/Transcendence ($p = .036$, $\beta = .216$) and RMM 6 Fantasy ($p = .041$, $\beta = .142$) most strongly predicted a higher lucid dreaming frequency.

Summary of stepwise multiple regression for FMI and RMM variables

Model	Independent Variable	B	β	t	Significance
1	Constant	1.790		1.56	.118
	FMI- Presence	.012	.136	.149	.882
	FMI- Acceptance	.050	.092	1.021	.309
2	Constant	-.152		-.119	.905
	FMI- Presence	-.017	-.020	-.225	.823
	FMI- Acceptance	-.008	-.015	-.156	.877
	Level 2b: Basic Mindfulness Quiet	.084	.092	1.179	.240
	Level 4: Mindful Deepening	.035	.035	.323	.747
	Level 5 Mindful Transformation/ Transcendence	.161	.216	2.117	.036*
	RMM 6: Fantasy	.128	.142	2.057	.041*

Note. Adjusted R^2 = .001, F = 1.053 (p =.351) for Model 1; Adjusted R^2 = .072, F = 3.654 (p =.002) for Model 2

Summary of stepwise multiple regression for RMM variables and meditation practice history

Model	Independent Variable	B	β	*t*	Significance
1	Constant	-.443		-.536	.593
	Level 2b Basic Mindfulness: Quiet	.068	.075	1.034	.302
	Level 4 Mindful Deepening	.035	.036	.339	.735
	Level 5 Mindful Transformation/ Transcendence	.158	.212	2.090	.038*
	RMM 6 Fantasy	.126	.139	2.051	.042*
2	Constant	-.464		-.560	.576
	Level 2b Basic Mindfulness: Quiet	.073	.080	1.101	.272
	Level 4 Mindful Deepening	.046	.046	.431	.667
	Level 5 Mindful Transformation/ Transcendence	.163	.219	2.139	.034*
	RMM 6 Fantasy	.123	.136	1.996	.047*
	Meditation Practice Frequency	-.043	-.042	-.560	.576

Note. Adjusted $R^2 = .080$, $F = 5.510$ ($p = .000$) for Model 1; Adjusted $R^2 = .077$, $F = .313$ ($p = .576$) for Model 2

We conducted another stepwise regression to evaluate the mediating effects of meditation practice. Given that experience with meditation did not significantly contribute to the model, and in fact weakened it, we examined the meditation variable in greater detail. After reviewing a histogram of the distribution of meditation practice frequency, we discovered a bimodal distribution showing two sample groups. We first dichotomized the variable into high/low meditators, with low meditators including anyone who practiced less than once a week. We re-ran the regression model and meditation practice frequency was again not significant. Recoding the variables helped the model, but it still did not significantly predict lucid dreaming frequency. We then hypothesized that only regular, almost daily meditation may have an effect. We ran the model once more with a different distribution in the dummy-coded variables, comparing frequent

(almost daily) meditators with self-reported score of 6, to infrequent meditators and meditation-naïve individuals (self-report score of 0-5). This resulted in another nonsignificant predictor model.

To determine in type of meditation practiced had any effect, an analysis of variance (ANOVA) was conducted. A main effect of "meditation type practiced most" approached significance for lucid dreaming frequency, $F(3, 164) = 2.401$, $p < .07$. A Tukey post hoc test revealed that those who practice FAc alone ($M = 3.82$, $SD = 2.13$) reported more frequent lucid dreams than did those who practiced FAs alone ($M = 2.38$, $SD = 2.11$), with a tendency toward significance of $p = .058$.

Discussion

The present study offers a deeper look at the relationships among mindfulness, meditation, and lucid dreaming frequency. This study used two measures of mindfulness: a narrow-band measure, the Freiberg Mindfulness Inventory (FMI; Walach et al., 2006); and a broad-band measure, The Relaxation, Meditation, Mindfulness Experiences Questionnaire, frequency version (Smith, 2019; RMMf) which measures 25 RMM states associated with relaxation, meditation, and mindfulness. All FMI and RMMf mindfulness variables with the exception of the single item RMM 6 Fantasy significantly correlated with meditation practice history, indicating a positive relationship between meditation practice frequency and both broad- and narrow-band assessments of mindfulness. All mindfulness variables except Fantasy also correlated with one another. Somewhat surprisingly, no narrow-band mindfulness variables from either the FMI or the RMMf correlated with lucid dreaming frequency. Neither FMI mindfulness total score nor the two FMI factors of Presence and Acceptance predicted lucid

dreaming frequency. Meditation practice history also did not predict lucid dreaming frequency. Lucid dreaming frequency did significantly correlate with RMM variables Basic Mindfulness: Quiet, Level 4 Mindful Deepening, Level 5 Mindful Transformation/Transcendence, and exploratory item RMM 6 Fantasy. Multiple regression analyses determined that roughly 8.8% of the variance in lucid dreaming frequency could be explained by mindfulness variables of RMM Level 4 Mindful Transformation /Transcendence and RMM 6 Fantasy. In other words, those who report more frequent lucid dreams are more likely to report transformative/transcendent meditative experiences and fantasy daydreaming.

Instead of finding a relationship between narrow-band mindfulness variables and lucid dreaming, the present study found a relationship among lucid dreaming and what Smith (2019) refers to as deeper levels of mindfulness. RMM Level 5, "Mindful Transformation/ Transcendence" includes individual RMM states, "Feeling REVERENT/PRAYERFUL," (RMM 20), "AWE/WONDER, DEEP MYSTERY of things beyond my understanding," (RMM 21), and "I felt a profound personal meaningful 'SPIRITUAL' or 'MYSTICAL' experience—sudden awakening or insight," (RMM 22). These items are atypical of standard, narrow-band mindfulness measures but are part of Smith's third-generation mindfulness theory because many advanced practitioners report these types of experiences frequently during meditation and in everyday life. Given that these theoretically deeper states of mindfulness predict lucid dreaming frequency, it is possible that lucid dreaming frequency is associated with levels of trait mindfulness developed through years of meditation and practice. However, causal relationships cannot be determined from this study.

Another surprising finding was lucid dreaming frequency's connection to item RMM 6, "Lost in FANTASY and DAYDREAMING." Fantasy and daydreaming are generally

considered the antithesis of the goals of mindfulness; however, daydreaming is a common occurrence even among those who are expert meditators. This relationship is possibly influenced by personality characteristics related to Openness to Experience. Openness to experience is one of McCrae (1994)'s "Big Five" factors of personality, with high scorers described as imaginative, artistic, sensitive to their inner world, and adventurous and open-minded. Hess, Schredl, and Goritz (2017) recently found a positive relationship between lucid dreaming and openness to experience. It is possible that individuals who are more sensitive to inner experiences and open to adventurous endeavors may have a predisposition to lucid dreaming or otherwise develop an interest in it. Interestingly, there is a small body of research specifically linking lucid dreaming frequency to fantasy-proneness, a subset of Openness to Experience. Fantasy-proneness refers to the characteristic tendency to have a deep, long-standing involvement in fantasy or imagination (Lynn & Rhue, 1988). This is consistent with the findings of Schredl and Erlacher (2004), who found LD frequency was associated with two facets of openness, "fantasy" and "openness." Participants also scored high on specific dimensions within openness to experience: thin boundaries, absorption, and imagination. Thin versus thick boundaries refers to a person's relative degree of closeness or separation between entities, processes, and functions in the mind (Hartmann, Elkin, & Garg, 1991). Individuals with thin boundaries tend to be trusting, sensitive, and emotionally vulnerable. Galvin (1990) studied lucid dreamers compared to nightmare sufferers and a control group, finding that lucid dreamers demonstrated thin boundaries compared to controls, and similarly thin boundaries but a more coherent sense of self than the nightmare suffers. Taken together, it may be interesting to consider the possibility that lucid dreaming, mindful transcendence, and fantasy are all a function of an individual's openness to experience.

It is important to note that we did not find the relationship between lucid dreaming and meditation or classical definitions of mindfulness that has been reported in the literature (Baird et al., 2018; Stumbyrs et al., 2015; Stumbrys & Erlacher, 2017). This could be due to sampling differences, as other studies recruited participants from a broad array of backgrounds and sources. Others used different measures of trait mindfulness, which captured different dimensions of experience than the FMI and the RMMf. The Describing scale on the FFMQ, which was significantly correlated to lucid dreaming, is not directly addressed in either the FMI or the RMMf. In Baird et al.'s (2018) study, the TMS's two factors of mindfulness, Curiosity and Decentering, and the FFMQ's Observing, Acting with Awareness, Nonjudging of Inner Experience, and Nonreactivity to Inner Experience dimensions did not significantly correlate with lucid dreaming frequency. This supports the findings of the present study, in that the narrow-band dimensions commonly assessed as aspects of mindfulness did not significantly correlate with lucid dreaming. Rider (2012) also did not find a direct relationship between lucid dreaming and narrow band mindfulness questionnaires, but in a qualitative review noted higher degrees of meta-awareness and mindfulness in the dream and waking life content. It may be that greater degrees of waking mindfulness are associated with higher degrees of mindfulness in dream content, as opposed to greater lucidity and lucid dreaming frequency. The content of dreams and lucid dreams may be an area of interest for future research. Future research should also examine the meta-awareness construct in greater detail to clarify the relationships between meditation and lucid dreaming.

Post-hoc analyses of meditation type indicated a difference between somatic and cognitive focus attention meditation type that approached signifance in predicting lucid dreaming frequency. Those who primarily practiced cognitive meditation focused on a mental image or

mantra reported more frequent lucid dreams than those who practiced somatic meditation focused on bodily sensation or breathing. Speculation about this relationship remains purely hypothetical, but it is possible that those who practice picturing certain images while meditating have a stronger ability to elicit images in sleep and dreaming than those who do not practice this skill.

The present study has implications for the self-report assessment of mindfulness. Classical measures are narrow-band and tap one or two dimensions, typically presence, awareness, and acceptance. A broad-band assessment that includes the full spectrum of levels of experience related to mindfulness may be a useful supplement. The present study found that experiences related to transcendence, transformation, and fantasy (all mindfulness-related) are associated with lucid dreaming frequency. The RMMf specific broad-band measure deployed here yields six general scales. However, the present study supports supplementary item-level analyses. Given that the assessment of mindfulness is still in its infancy, supplementary item-level analyses may prove to be fruitful as well.

Limitations

There are several limitations to this study. First, the self-report nature of the questionnaires limited the results and possibly influenced the outcome of certain assessments. Lucid dreaming frequency estimation across populations in self-report studies varies tremendously, with no clear reason why. However, there is a tendency for dreams to be underreported in self-report measures when compared to logbook methodologies (Aspy, Delfabbro, & Proeve, 2015). Therefore, lucid dreaming frequency may be a phenomenon best explored through other methodologies. Aspy et al. (2015) also argue that the retrospective self-

report nature of dream recall questionnaires relies on meta-cognitive abilities and memory, which may be the cause of different study designs yielding meaningfully different results. Second, there were some weaknesses in the content and design of the questionnaires. The meditation practice history questionnaire design hindered comparisons to previous research, as years of experience with regular meditation was not asked. It was also unclear as to whether participants could select multiple types of regular meditation practices. The lucid dreaming questionnaire could have also incorporated more questions regarding lucid dreaming experiences, including content and degree of volitional control, as these may provide a richer picture of this relationship than frequency alone. Finally, the normality of residuals with Lucid Dreaming Frequency was not evenly distributed. This violates one of the assumptions of the multiple regression test, which could have skewed the results. Since regression analyses are fairly robust to violations of normality assumptions, we continued. Future researchers may want to pursue other statistical analyses to determine if there is a better model to fit the data.

Summary

The present study examined the relationships among mindfulness, lucid dreaming frequency, and meditation as experiences involving meta-awareness during waking and sleeping. Surprisingly, meditation and narrow-band mindfulness assessments did not predict lucid dreaming frequency as previous studies have found. Rather, lucid dreaming frequency was primarily predicted by transcendent experiences and involvement in fantasy and daydreaming. These findings speak to the importance of using broad-band mindfulness measures that assess for other facets of mindfulness, like transcendence and fantasy, outside of the traditional scales of presence, acceptance, and awareness. These results may also indicate that lucid dreaming is a

function of personality characteristics like Openness to Experience and having thin boundaries, but future research is needed to determine the extent of these relationships.

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