Chapter 4
Connectedness to Nature Through Outdoor Environmental Education: Insights from Psychology

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4.1 Connectedness to Nature Through Outdoor Environmental Education: Insights from Psychology

One of the emerging goals of many outdoor environmental education (OEE) programs is to connect individuals to the natural world (see Barrable & Booth, 2020; Pirchio et al., 2021). This goal is both laudable and shared by many who are concerned with the relationship between humans and nature. Across a range of disciplines from the humanities, social sciences, and natural sciences, working to increase an individual's sense of connectedness to nature is a critical step toward a more environmentally responsible society (c.f., Crimston et al., 2016; Leopold, 1949; Naess, 1987; Schultz, 2002; Stern et al., 1999). For example, Naess (1987) suggests that including nature in our self—and vice versa—is critical to altering our treatment of the environment for the better. Echoing these claims, modern-day environmental psychologists (e.g., Schultz, 2002) have contended that connectedness to nature—the extent to which nature is included in an individual's sense of self—is a critical precursor of nature-centered concern for the environment and commitment to protecting it.

Supporting these contentions, individuals who feel more connected to nature are more pro-environmentally disposed (see Whitburn et al., 2020 for a meta-analysis). Interestingly, these individuals also tend to have better psychological well-being (e.g., Mayer et al., 2009) and are more pro-social (e.g., Pirchio et al., 2021). Thus, because it may simultaneously promote the health of both the planet and people, connectedness to nature is of particular interest in outdoor environmental education

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and in other contexts where the goal is to fundamentally change the way people relate to the natural world.

This chapter will review the psychological literature concerning the predictors of connectedness to nature and then connect the insights from psychology to the specific context of OEE. We begin by defining connectedness to nature from the perspective of environmental psychology and then describe the most relevant literature on the predictors of connectedness to nature. Last, we consider the broader implications of the reviewed findings for OEE.

4.2 Insights from Psychology

4.2.1 Definitions of Connectedness to Nature

Clarity regarding any goal is instrumentally important for adequately assessing progress toward that goal. Thus, it is particularly important to carefully define exactly what we mean by connectedness to nature if our goal is to promote it. Two points of emphasis are found in the definitions of connectedness to nature (connectedness hereafter) used by environmental psychologists. Definitions of connectedness often emphasize (1) a merging of self and nature (e.g., Schultz, 2002) and (2) a feeling of oneness or unity with nature (Mayer & Frantz, 2004). Importantly, both points of emphasis emerge in qualitative analyses of how individuals explain what connectedness means to them (Unsworth et al., 2016). Given these considerations, we define connectedness as the psychological joining of nature and the self, which manifests as a sense of oneness with nature (see Lengieza & Swim, 2021).[1]

4.2.2 Overview

The review of the literature found within environmental psychology is separated into three thematic categories: (1) situational contexts (i.e., experiences with nature & activities); (2) internal psychological states (i.e., mindfulness, states that involve our sense of self, affect and motivation); and (3) individual differences (i.e., demographics, personality, and worldviews) that influence connectedness. Connections to OEE are integrated throughout the review; however, each section ends with a summary of the findings outlined in that section and how they can inform OEE.

Each of the three sections has the potential to inform OEE in slightly different ways. First, the "*Situational Contexts*" section focuses on how both (a) a variety of

[1] This definition treats connectedness as distinct from what is most aptly referred to as environmental*ist* identity which instead focuses on whether one views themselves as a person who engages in various forms of pro-environmental behavior, or outright views themselves as an environmentalist (e.g., Kashima et al., 2014).

experiences with nature and (b) a variety of activities might facilitate or hinder connectedness. Thus, insights from this section should be especially relevant for informing OEE planning, including the practices and elements that should be incorporated into OEE experiences and the settings in which they should ideally occur. Next, the "*Psychological States*" section focuses on how connectedness is impacted by psychological states related to mindfulness, the self, and affect. In this section, we emphasize the importance of focusing on underlying processes—relevant for both OEE planning and evaluation—and how such a focus can guide decisions about activities that can enhance and detract from the connectedness-promoting qualities of OEE. Finally, the "*Individual Differences*" section highlights the influence that demographic characteristics, personality, and worldviews may have on connectedness. Insights found within this section will both point to potential moderators of the effect that OEE programs have on connectedness and may help guide decisions about how to best tailor programs to the demographic groups they serve. This section, especially the literature on worldviews, might also inform decisions about what other outcomes serve as dual-purpose stepping-stones that indirectly support connectedness.

4.2.3 Situational Contexts that Influence Connectedness

Situational context influences many psychological phenomena, including connectedness. The situational contexts most important to consider for connectedness are (a) experiences with nature—including virtual nature—and (b) the emergent context created by engaging in different outdoor activities. It is worth noting that this section could easily include outdoor environmental education itself; however, we save such findings for later in the chapter.

Knowing the situational contexts that support connectedness and those that hinder it can guide decisions about which contextual features might most support OEE's goal of promoting connectedness to nature. In other words, the research reviewed in this section—especially in conjunction with the research reviewed in the section on psychological states—can help identify (a) in which settings OEE will best promote connectedness and (b) which activities make the most sense to include in OEE.

4.2.3.1 Experiences with Nature

Unsurprisingly, experiences with nature are a robust predictor of connectedness; to have a relationship with nature, one needs to interact with it (Lengieza & Swim, 2021). These interactions with nature, however, can take many forms. In some cases, the experiences with nature that impact connectedness can involve actual, first-hand contact, such as walking in nature (e.g., Mayer et al., 2009). In other cases, the interaction with nature can be mediated by technology and still have an

impact on connectedness—such as viewing pictures (e.g., Richardson & Sheffield, 2015), watching videos of nature (e.g., Soliman et al., 2017), or even immersive experiences provided by virtual reality (e.g., Ahn et al., 2016). Consequently, we review both types of experiences with nature (i.e., first-hand and mediated) below.

First-Hand Contact with Nature

Many studies have demonstrated that first-hand experiences with nature, in a variety of forms, improve connectedness (e.g., Beery, 2013; Braun & Dierkes, 2017; Kals et al., 1999; Lumber et al., 2017; Mayer & Frantz, 2004, S1; Nisbet et al., 2009; Schultz & Tabanico, 2007, S3–5; Tam, 2013). The connectedness-promoting-effect of spending time in nature seems to hold for mundane or ordinary experiences with nature, such as walking in nature (Mayer et al., 2009; Nisbet & Zelenski, 2011; Nisbet et al., 2019), as well as for exceptional experiences with nature, such as nature-based tourism (Burbach et al., 2012; Wheaton et al., 2016) and wilderness expeditions (Barton et al., 2016; Richardson et al., 2016). Further, the interactions one has with nature need not be confined to only organic, wild, or "pristine" nature to promote connectedness but can also involve human-made nature, such as zoos (e.g., Bruni et al., 2008; Schultz & Tabanico, 2007) and urban gardens (Uhlmann et al., 2018). Connectedness can even be promoted by incredibly subtle exposure to nature, such as the presence of plants in a lab space (Weinstein et al., 2009, S4) or, intriguingly, simply removing one's shoes while outside. One study found that being comfortable walking barefoot outdoors was associated with increased connectedness (Harvey et al., 2016). An experimental study later corroborated this effect, implying that tactile contact with nature may cause increases in connectedness to nature (Rickard & White, 2021). Ultimately, many studies conclude that the effect of acute (i.e., one-time) first-hand experiences with nature on connectedness is positive.

The frequency of experiences with nature also matters; a single isolated experience with nature is likely not enough to achieve the highest possible level of connectedness. Studies have shown that more frequent self-reported experiences with nature are associated with higher levels of connectedness (e.g., Hinds & Sparks, 2009; Kals et al., 1999; Larson et al., 2018; Mayer & Frantz, 2004, S1; Nisbet et al., 2009; Pensini et al., 2016; Richardson et al., 2016; Rosa et al., 2018; Schultz & Tabanico, 2007, S5; Scott, 2010, S1–2; Swami et al., 2016; Tam, 2013, S2). Similarly, living closer to nature (e.g., Cheng & Monroe, 2012) or in a rural environment (e.g., Harvey et al., 2016; Hinds & Sparks, 2009), which should afford more opportunities for interacting with nature, are also associated with higher levels of connectedness. Thus, experiences with nature, especially with greater frequency, are an important determinant of connectedness to nature.

Characteristics of Nature

Contact with nature in broad terms seems to robustly promote connectedness. However, there is some evidence that contact with certain *types* of nature may have differential impacts on connectedness. In other words, the characteristics of the natural context—the presence of specific attributes (e.g., greenery, water, etc.) as well as situational elements of the nature experience (e.g., weather, immersion, etc.)—also influence the effect on connectedness (e.g., Wyles et al., 2019).

Intuitively, compared to lower quality natural areas, higher quality natural areas (i.e., protected areas) may be more likely to promote connectedness (Wyles et al., 2019). Additionally, connectedness seems to be better supported by *rural* green spaces compared to *coastal* blue spaces (e.g., oceans; Wyles et al., 2019). However, some evidence suggests that *coastal* green spaces and *coastal* blue spaces may actually have similar effects on connectedness (Rickard & White, 2021) and the authors know of no research comparing rural blue spaces (e.g., lakes and rivers) to rural green spaces (e.g., forests and mountains). In other words, there is plenty of room for debate about blue spaces versus green spaces. Additionally, global factors like weather and season may influence connectedness. Participants report lower levels of connectedness during the winter compared to autumn and spring and on rainy days compared to non-rainy days (Duffy & Verges, 2010).

The relative intensity of the nature experience may also influence connectedness. For example, longer experiences with nature are associated with higher levels of connectedness (Wyles et al., 2019). Further, exposure to plants (referenced above, Weinstein et al., 2009, S4) resulted in different levels of connectedness depending on how immersed the participant was. Participants who reported being more immersed when exposed to plants felt greater connectedness than those who reported less immersion, whereas the opposite was true when participants were not exposed to plants (Weinstein et al., 2009, S4). This effect was also found in two precursor studies using pictures of nature (Weinstein et al., 2009, S2 & S3). Thus, being more absorbed, so to speak, while in natural environments may facilitate connectedness. This observation is important to the extent that some settings are more immersive than others.

Childhood Contact with Nature

The above findings emerged almost entirely from research on adult experiences in nature. However, a handful of research studies focus on the importance of childhood experiences with nature. Like adult experiences, childhood experiences with nature also positively predict connectedness (Beery, 2013; Cheng & Monroe, 2012; Hinds & Sparks, 2009; Pensini et al., 2016; Rosa et al., 2018; Tam, 2013; Cleary et al., 2020). However, the long-term impact of childhood experiences with nature on connectedness may primarily operate through their influence on contact with nature later in life (Pensini et al., 2016; Rosa et al., 2018). In other words, childhood experiences may promote connectedness in the long term specifically because they make individuals more likely to continue engaging with nature. Further, it has been suggested that children have an innate connectedness to the natural world. Contact with

nature can help build this connection and shape their sense of self in relation to nature, which can carry through to adulthood (Phenice & Griffore, 2003). Although it should be noted that prior childhood contact with nature may not be *necessary* for adults to gain an increased sense of connectedness when in nature (Cleary et al., 2020), it may be "never too late" to start spending time in nature.

These findings suggest that encouraging children to have experiences with nature (e.g., through OEE) earlier in life can create a life-long cycle of interacting with nature, as is emphasized in some writings on promoting connectedness through OEE (see Braun & Dierkes, 2017). However, this process does not strictly have to begin in childhood. It is also worth noting that, despite psychological research investigating the importance of experiences with nature for fostering connectedness using both child and adult samples, there is still much to learn about experiences with nature across the lifespan. For now, we must assume that findings from adults generalize to children and vice-versa until more research better investigates the differential process that might be at play at different life stages.

Applications to OEE: First-Hand Experiences with Nature

A critical part of OEE is spending time in nature, which bodes well for programs seeking to connect learners with nature. However, the nuances of experiences with nature raised in this subsection are important for OEE because they highlight the value of carefully considering the physical context in which OEE experiences occur. For example, environments that *feel* more immersive (e.g., removed from the hustle and bustle of everyday life) may be more suited to promote connectedness, and natural areas that *feel* higher quality may be a better context for OEE. It is important to note that we emphasize *feel* because that will be the psychologically more impactful factor (moreso than what might be objectively true).

This research also implies that it is important to consider the ramifications of OEE that extend beyond any one acute OEE experience. The frequency of nature experiences matters, and research on childhood experiences with nature suggests that fostering lifelong, repeated experiences with nature is ideal. Consequently, OEE is not a bandage we can apply once and expect to take hold without deliberately encouraging future engagement with nature. Program planning efforts might benefit from considering ways OEE can promote future engagement with nature outside of the OEE "classroom." Further, OEE evaluation efforts should assess immediate short-term effects on connectedness as well as medium- and long-term effects that OEE has on future engagement with nature.

Mediated Experiences with Nature

In addition to first-hand experiences with nature, individuals can have experiences with nature that are mediated by technology. Such experiences can provide insights into the types of programming that complement the central features of OEE. As it turns out, such mediated experiences with nature may also increase connectedness.

For example, viewing pictures (e.g., Richardson & Sheffield, 2015; Scott, 2010, S3) or videos of nature (Mayer et al., 2009, S2–3; Soliman et al., 2017; Zelenski et al., 2015, S3) can result in increased connectedness. However, these findings may depend on the level of immersion in the virtual forms of nature, similar to first-hand exposure to nature (e.g., Weinstein et al., 2009, S2–3; but also see Soliman et al., 2017[2]).

To the extent that immersion is an important situational consideration, it is unsurprising that immersive technology like virtual reality (VR) has also been considered as a way to increase connectedness. Research on VR and connectedness is in its infancy, and, therefore, our understanding of how VR impacts connectedness is incomplete. Thus far, some studies have demonstrated that VR can better promote connectedness than ordinary video (i.e., Ahn et al., 2016, S1–2; Yeo et al., 2020) and non-nature VR (Sneed et al., 2021). In contrast, others suggest that VR has no benefit over videos (i.e., Ahn et al., 2016, S3; Soliman et al., 2017). Finally, a pre-post study with children found that connectedness did not change after a virtual hike (Bruni et al., 2017, S3), but this may be attributable to the one-off virtual-hike being too distracting for children due to its novelty. Consequently, at present, VR simply represents an exciting but promising possibility for promoting connectedness, but more research is undoubtedly needed.

Applications to OEE: Mediated Contact

This section on mediated contact with nature suggests three things. First, it suggests that technology-aided components of OEE experiences may be a valuable complement to *in-situ* activities. For example, a valuable addition to OEE programming could be incorporating lessons where participants in OEE learn about the similarities between their local context and some distant foreign context using the assistance of technology. Second, it also suggests that we might be able to use technology to highlight aspects of nature that can be experienced no other way—for example, using time-lapse videos to show natural processes on a timescale otherwise incomprehensible to humans. Third, it suggests that OEE may be able to become more accessible to urban residents. Urban OEE programs might capitalize on the advent of educational technology (e.g., educational documentaries) to incorporate virtual field trips to experience natural areas that would otherwise be inaccessible.

However, we provide a cautionary note. Although several studies have identified viewing nature in the form of videos and pictures as potential ways of promoting connectedness, it is important to acknowledge that some studies report no effect of viewing pictures (Dopko et al., 2014, S1–2) or videos of nature (Zelenski et al., 2015, S1). Additionally, the effect of videos and some forms of VR—and, by logical extension, likely the effect of pictures as well—may fall short of actually spending

[2] The discrepancy between these two findings is likely because in one study immersion was manipulated via a mental imagery script (Weinstein et al., 2009) whereas in the other immersion was manipulated in the form of the technology used (e.g., video vs. VR; Soliman et al., 2017).

time in nature (e.g., Mayer et al., 2009, S2–3; see Sneed et al., 2021). Thus, mediated experiences with nature should both be used with caution—as they may not *always* be effective—and to complement, rather than replace, first-hand experiences with nature.

4.2.3.2 Activities

The above section highlighted that the 'where' of OEE is an especially important consideration when seeking to promote connectedness to nature. We also alluded to the importance of the '*what'* of the situation (c.f., the importance of duration, immersion, and even footwear). In this section, we further elaborate on how the activities in which one engages (i.e., the 'what') influence connectedness. Indeed, many activities promote connectedness, for example, activities including direct contact with nature, such as outdoor recreation (e.g., Beery, 2013). Others—including meditation (e.g., Aspy & Proeve, 2017) and the use of psychedelics (e.g., Nour et al., 2017)—can occur without any contact with nature.

Activities as Part of Nature Experiences

A number of activities in which experiences with nature are an inherent element are positively associated with connectedness. Specifically, gardening (e.g., Beery, 2013; Sanguinetti, 2014; Uhlmann et al., 2018), planting trees (e.g., Whitburn et al., 2019), walking dogs (Beery, 2013; Wyles et al., 2019), having picnics in nature (Beery, 2013), studying plants and animals (Beery, 2013), depicting nature artistically (Bruni et al., 2017), as well as receiving interpretation while touring nature parks (Burbach et al., 2012) have all been positively associated with connectedness. Further, one study suggests that deliberately noticing nature can increase connectedness above and beyond any increases caused by the mere fact that it involves an experience with nature. In this study, participants in a business-as-usual condition and participants in a notice-nature condition spent an equal amount of time in nature, yet only the participants who were instructed to notice nature experienced increased connectedness (Passmore & Holder, 2017). This study highlights that, even when participants are already in nature, deliberate engagement in specific activities can further promote connectedness.

Applications to OEE: Activities in Nature

Overall, the research on activities that promote connectedness suggests that including activities that involve caring for nature (e.g., gardening, planting trees) and active engagement with nature (e.g., studying nature, engaging with nature artistically, and noticing nature) in OEE programming might be especially important facilitators of connectedness. Likely, such activities are already incorporated into

OEE programming; thus, these findings should simply reinforce their value. However, once again, there are some nuances to the application of these findings.

Some activities involve direct contact with nature but do not promote connectedness. For example, beach-going and playing on playgrounds failed to correlate with connectedness (Bruni & Schultz, 2010, S3). Perhaps more interestingly, other activities involving direct contact with nature might hinder connectedness, such as waterskiing and wakeboarding (Beery, 2013) and exercising or playing in nature (Wyles et al., 2019). In the case of these activities—all of which seem to have a recognizable emphasis on the hedonic use of nature—it is possible that nature ends up being treated as no more than a convenient setting for the given activity. If this is the case, it could reduce nature to a non-salient background element of the experience or, worse, might cause nature to be viewed solely as a means to an end, potentially explaining the null/negative effects. More generally, the fact that these activities decrease connectedness despite being experiences with nature suggests that we must be deliberate in the activities we include in OEE experiences; some activities might actually work against the goal of promoting connectedness to nature.

It is important to note, however, that the adverse effects of working and playing in nature on connectedness may be culturally dependent. For example, research has shown that rural children engaging in outdoor tasks such as herding, collecting firewood, farming, and hunting might combine these activities with play and reported pride in their environmental competence (Gold & Gujar, 2007) and greater connectedness (Nabhan & Trimble, 1994; additionally see Chawla, 2020). The activities reported in these studies involve direct contact with nature and center nature as an integral part of the activity. Therefore, the importance of nature to the activity—whether it is merely a convenient setting for the activity versus nature being part of the central focus of the activity—might determine the effect of the activity on connectedness. Educators should then be deliberate in designing programs and activities that do not just take place outdoors but which make nature an integral part of the learning experience.

Activities Without Nature

Other activities can promote connectedness but do not necessarily involve actual experiences with nature. While they do not involve direct experiences with nature, these activities can influence how we think about nature and, therefore, the potential to connect to nature. Such activities include meditation, other reflective practices, and the use of psychedelics. All these activities can be done as part of an experience with nature; however, they do not *need* to involve nature directly.

Meditation

Meditation is a recently re-popularized phenomenon that has been studied in a variety of areas, including the context of connectedness to nature. From a Western understanding, meditation is a set of practices designed to cultivate particular

mental qualities through repeated induction of a mental state (Lutz et al., 2007). Thus, at its core, meditation is a practice directly intended to alter how we think (c.f., Lutz et al., 2007). As a word of note, while one commonly known form of meditation is mindfulness meditation, other meditative practices do not focus on mindfulness.

Research suggests that meditation (Beery, 2013; Nisbet et al., 2019; Unsworth et al., 2016) and yoga (Beery, 2013) might effectively enhance the already positive effect of spending time in nature on connectedness. For example, individuals who spent time meditating in nature felt greater connectedness than individuals who just spent time in nature without meditating (Nisbet et al., 2019; Unsworth et al., 2016). However, the effect of meditation may not require contact with nature. For example, compared to self-administered progressive muscle relaxation, self-administered mindfulness meditation and loving-kindness meditation have been associated with connectedness without contact with nature (Aspy & Proeve, 2017). This suggests that meditative practices might have effects that are entirely disconnected from those of contact with nature. This evidence is interesting because it suggests that, first and foremost, OEE experiences may benefit from directly incorporating meditative practices into daily programming. However, it also suggests that the effectiveness of OEE, at least concerning connectedness, may be enhanced by including meditation-based 'homework' assignments that do not necessarily need to involve nature.

Reflection

In the abstract, the changes in our way of thinking that are encouraged by meditation seem especially related to encouraging more reflective modes of thinking. Beyond meditation, however, there are other ways to encourage reflective thinking and alter the way we think. Importantly, some of these other reflective ways of thinking may also positively impact connectedness. For example, differences in how we reflect upon past experiences (e.g., eudaimonic vs. hedonic reflection vs. mundane recollection) may influence connectedness (Lengieza et al., 2021). Specifically, engaging in reflection focusing on meaning and purpose derived from some experience (i.e., eudaimonic reflection) resulted in affective states that promoted down-stream increases in connectedness, whereas reflecting on the fun and pleasure derived from an experience (i.e., hedonic reflection) did not (Lengieza et al., 2021).

Additionally, supporting the importance of altering our ways of thinking to promote connectedness, there are educational pedagogies that may promote connectedness. For example, consider Langerian mindful learning,[3] learning that is designed to foster flexible and open mindsets (Tang et al., 2017) as well as shift thinking patterns away from more pervasive modes of thinking found within the educational context (Wang et al., 2016). Compared to other forms of learning, mindful learning

[3] Not to be confused with the Buddhist perspective on mindfulness (see Langer, 2000).

has been associated with higher levels of connectedness (Wang et al., 2016; Wang et al., 2019). Finally, we can alter our thinking about nature by consciously choosing to think about nature in a different light. For example, anthropomorphizing nature might be an effective means of increasing connectedness (Liu et al., 2019; Tam et al., 2013). Thus, there is increasing evidence that altering the way we think (e.g., meditation, mindful learning) and what we think about (e.g., the content of reflections, anthropomorphizing nature) can increase connectedness. As mentioned above, this suggests that both direct incorporations of reflective lessons in OEE programming as well as reflective 'homework' activities can potentially enhance the effects of OEE on connectedness.

Applications to OEE: Activities Without Nature

This section highlights that incorporating deliberate attempts to fundamentally change the way people think into OEE programming is critical in promoting connectedness. In both the case of mindfulness and reflection, there is an exciting possibility that the impact of OEE experiences does not have to end when learners leave the outdoor classroom. Indeed, OEE programs might see an enhanced impact on connectedness to nature simply by including at-home mindfulness- or reflection-based programming. Still, it should be noted that even subtle differences in the framing of reflections can have important implications for their psychological outcomes. For example, one study found that the subtle difference between writing about "how humans are similar to animals" and "how animals are similar to humans" resulted in different levels of moral concern for both animals and marginalized groups. The former resulted in less moral inclusion, the latter in greater moral inclusion (Bastian et al., 2012). Thus, it would be most prudent to empirically evaluate the effects of any reflective programming before making widespread changes.

4.2.4 Psychological States that Influence Connectedness

In addition to situational factors, many psychological states influence connectedness. It is especially valuable to consider the specific psychological states that may serve as pathways, or barriers, to connectedness. Such research contributes to our understanding of the processes through which other antecedents of connectedness may have their effect. If we understand the nuances of the process underlying a given predictor of connectedness, such as spending time in nature or meditation, we can better design programs that enhance that specific process to increase the impact of any given OEE program. In other words, the research in this section will inform what psychological factors can be leveraged in efforts to increase connectedness. The states reviewed in this section can be categorized as related to mindfulness, the self, and affect.

4.2.4.1 Mindfulness

Earlier in this chapter, we discussed meditation as an activity. However, as mentioned above, not all meditative practices focus on mindfulness (e.g., loving-kindness meditation). Consequently, we have included this separate section on mindfulness to avoid conflating meditation and mindfulness. Additionally, meditation, even when it *is* aimed at increasing mindfulness, might result in changes in phenomena other than mindfulness, and those changes might turn out to be the primary route of influence that meditation has on connectedness. In other words, evidence that meditation influences connectedness does not necessarily indicate that mindfulness, as a psychological quality of the mind, is the mechanism that influences connectedness (see Lengieza & Swim, 2021 for elaboration). For example, hypothetically, meditation might simply increase individuals' ability to introspect, and such an increase in introspection might be the pathway to some hypothetical increase in connectedness (c.f., Richardson & Sheffield, 2015). Thus, it is important that research documents explicitly the association between mindfulness and connectedness. Conversely, just because evidence suggests that mindfulness is associated with connectedness does not inherently imply that meditation will automatically increase connectedness, which we will elaborate on below.

Fortunately, a recent meta-analysis suggests a robust positive association between mindfulness and connectedness (see Schutte & Malouff, 2018). Consequently, it seems unnecessarily redundant to outline the findings related to mindfulness and connectedness individually. However, we feel that there is one important trend worth highlighting.

Mindfulness is a multifaceted and nuanced construct that can be broken down into five facets: "observing", "describing", "non-reactivity", "non-judging", and "acting with awareness". Mindfulness as a general construct has been associated with higher levels of connectedness (Schutte & Malouff, 2018; e.g., Howell et al., 2011; Richardson & Sheffield, 2015, S1–2; Unsworth et al., 2016, S1). However, certain facets seem to be more related to connectedness than others. Specifically, the "observing" (Barbaro & Pickett, 2016, S1–2; Hanley et al., 2017), "describing" (Barbaro & Pickett, 2016, S1–2), and "nonreactivity" (Barbaro & Pickett, 2016, S1–2; Hanley et al., 2017) facets of mindfulness have been associated with connectedness whereas the "nonjudging" (Barbaro & Pickett, 2016, S1–2; Hanley et al., 2017) and "acting" (Barbaro & Pickett, 2016, S1; Hanley et al., 2017) facets have not. In other words, not all facets of mindfulness influence connectedness (e.g., Barbaro & Pickett, 2016).

This point of nuance is especially relevant because it suggests that not all meditative practices might be an effective means of influencing connectedness. There are numerous interventions that one could feasibly consider to increase mindfulness, but they might not influence each of the facets of mindfulness equally. Therefore, one might accidentally select a mindfulness intervention that fails to target one of the facets associated with connectedness (i.e., "observing", "describing", "nonreacting"). For example, sitting meditation might primarily target the "non-judging" facet of mindfulness (Sauer-Zavala et al., 2013), which does not impact

connectedness (e.g., Barbaro & Pickett, 2016). Body scan meditation and yoga, on the other hand, seem to primarily target the "describing" facet of mindfulness (Sauer-Zavala et al., 2013), which *has* been correlated with connectedness (e.g., Barbaro & Pickett, 2016). Thus, this would suggest that incorporating sitting meditation into OEE might not be optimal, whereas yoga and body scan meditation might be particularly effective; the former fails to target the proper mechanisms, whereas the latter two succeed. Such insight would be lost without this nuanced view of mindfulness and careful consideration of the underlying process behind a given intervention. This is a relevant consideration for all programming, not just meditation and mindfulness; however, this happened to provide an exceptional illustration of its importance.

Applications to OEE: Mindfulness

Substantial research has demonstrated a link between mindfulness and connectedness, and we can be reasonably confident that mindfulness increases connectedness (Schutte & Malouff, 2018). Thus, incorporating programming that directly emphasizes mindfulness, such as mindfulness meditation and yoga, into OEE programming might enhance the effect of OEE on connectedness. However, as noted above, there is evidence to warrant being especially deliberate about which facet of mindfulness is emphasized in any OEE programming. Specifically, programming should likely focus on incorporating mindfulness-supportive activities that will affect connectedness *through* changes in the "observing", "describing", "nonreacting" facets of mindfulness. More generally, this example hopefully demonstrates the importance of considering the *process* through which situational and contextual features influence connectedness.

4.2.4.2 Psychological States Related to the Self

Mindfulness is seemingly one of the most popularly studied psychological states that influence connectedness. However, there are other important states to consider. Ultimately, definitions of connectedness describe it as including nature in the self. We can, therefore, expect that psychological states associated with the self would influence connectedness (Lengieza & Swim, 2021). The most notable psychological state related to the self that influences connectedness is self-awareness.

Negative Impacts of the Self on Connectedness

Studies suggest that there might be a negative effect on connectedness brought about by taking oneself as the object of awareness or, phrased differently, thinking about oneself from the perspective of an observer. Across three samples of women, self-objectification—viewing the self from the perspective of a *critical*

observer—was negatively associated with connectedness (Scott, 2010). Another study demonstrated that experimentally inducing increased objective self-awareness (i.e., seating participants in front of a mirror) diminished connectedness (Frantz et al., 2005).[4] Moreover, other evidence suggests that being publicly self-aware—that is, being more concerned with how you appear to others—is negatively associated with connectedness (Mayer et al., 2009) and that decreases in public self-awareness underly the process through which spending time in nature increases connectedness (Lengieza & Swim, 2021). Finally, rumination—defined as anxious, or preoccupied, attention focused on the self, emphasizing self-worth or failure—is negatively correlated with connectedness (Richardson & Sheffield, 2015). Thus, excessively focusing on oneself from a third-person or critical perspective seems to have a negative impact on connectedness.

This may be an important insight for OEE programming because it suggests that we want to be mindful of avoiding activities that evoke pre-occupied or anxious self-attention in participants. This suggests that, while there is likely value in encouraging learners to get out of their comfort zone, we should avoid making OEE participants embarrassed or self-conscious, in the colloquial sense, through our programming.

Other evidence also implies that a reduced emphasis on the self may be important for facilitating connectedness. First, mindfulness may promote connectedness because of its effect on decentering (Hanley et al., 2017; see also Nisbet et al., 2019), which has been linked to a blurring of the self-other dichotomy (Hanley et al., 2018). Thus, the association between decentering and connectedness further implicates a lessened focus on the self—at least the independent and distinct self (c.f., Markus & Kitayama, 1991)—as an important predictor of connectedness. Second, the extent to which individuals experienced ego-dissolution—the pharmacologically induced state of selflessness associated with psychedelics—during their self-reported most significant experience with psilocybin is associated with higher reports of connectedness (Nour et al., 2017). Thus, this evidence would further support the notion that some diminishment of attention to the self might promote connectedness.

Positive Influences of the Self on Connectedness

While the above evidence suggests that focusing on the self gets in the way of connectedness to nature, reality may not be so clear-cut. Indeed, other evidence suggests that 'the self' might not always be an obstacle on the path to connectedness. Private self-awareness—being aware of one's inner experience, effectively synonymous with introspection—may enhance connectedness (Mayer et al., 2009), unlike

[4] This effect was primarily true for individuals who held less positive environmental attitudes; individuals with highly positive environmental attitudes experienced similar levels of connectedness in either condition (Frantz et al., 2005) which may be reflective of a ceiling effect for connectedness among individuals who already hold strong pro-environmental attitudes.

objective self-awareness and public self-awareness. Consistent with this finding, reflective self-attention appeared to be a better predictor of connectedness than mindful attention (Richardson & Sheffield, 2015, S1–2). Moreover, how we construe the self (e.g., interdependent, independent, etc.) seems to influence connectedness. Focusing on the self from an interdependent perspective is associated with greater connectedness (Davis & Stroink, 2016b). In other words, there are cases where positively focusing on the self can promote connectedness to nature. Most importantly, higher levels of reflective self-attention might strengthen the effects of contact with nature on connectedness (Richardson & Sheffield, 2015, S3), suggesting that orienting individuals toward an introspective type of self-attention can be used to enhance OEE.

Thus, while we should be cautious about creating heightened public, ruminative, or unduly critical self-awareness through the programming incorporated in OEE, directly involving participants' sense of self may be an important ingredient for increasing connectedness. Specifically, it may be valuable to incorporate programming that involves a great deal of introspection (see also the earlier sections on reflection and meditation), and it may be valuable to directly promote interdependent self-construals, as two examples.

Applications to OEE: The Self

Self-related phenomena are an important source of influence on connectedness. Specifically, how we attend to the self (e.g., Richardson & Sheffield, 2015) and how we subjectively experience the self (e.g., Hanley et al., 2017; Nour et al., 2017) influence connectedness. At the very least, it is important to recognize that there is mounting evidence that self-related phenomena are an important part of the formation of connectedness. OEE programs might find it useful to consider including lessons that challenge participants to change how they think about nature and challenge them to change how they think about themselves. After all, connectedness fundamentally involves our sense of self.

However, there is a degree of nuance to the relationship between self and nature. In some cases, paying attention to the self promotes connectedness (e.g., private self-awareness), and in others, it hinders it (e.g., public self-awareness). In other words, in the context of connectedness, there may be such a thing as a healthy and unhealthy focus on the self. Activities that make participants think about the self in a way motivated by introspection and curiosity about oneself (c.f., Richardson & Sheffield, 2015) will likely contribute to increased connectedness. In contrast, activities that make participants of OEE feel self-conscious or overly concerned with how they appear to others will likely work against efforts to increase connectedness. Thus, once again, it is important to consider 'process' and deliberately select activities that impact individuals' sense of self in a way that promotes connectedness.

4.2.4.3 Affect and Motivation

The reader may not be surprised to learn that affective states influence individuals' sense of connectedness. A meta-analysis suggests that positive affect is positively correlated with connectedness (see Capaldi et al., 2014). In fact, increased positive affect may be one of the psychological mechanisms through which contact with nature increases connectedness (Nisbet & Zelenski, 2011). Additionally, studies have shown that negative affect is negatively correlated with connectedness (Dopko et al., 2019; Mayer et al., 2009, S2; Nisbet & Zelenski, 2011, S4; Nisbet et al., 2011).

Although it is true that positive affect, in general, has a positive effect on connectedness, research also suggests that it is important to differentiate between different types of positive affect, much like the research on mindfulness. Specific forms of positive affect, such as awe (Nisbet et al., 2019; Yang et al., 2018) or similar types of elevating emotions (Capaldi et al., 2017, S1; Lengieza et al., 2021) are positively associated with connectedness. Moreover, experiencing meaning and purpose, a component of eudaimonic affect, is positively correlated with connectedness (Capaldi et al., 2017, S1; Hinds & Sparks, 2009; Howell et al., 2011, S1–2; Nisbet et al., 2011, S1 & S3). Hedonic affect, on the other hand, was no longer associated with connectedness after controlling for eudaimonic affect (Lengieza et al., 2021), suggesting that not *all* forms of positive affect will promote connectedness. The reader will also recall that hedonic activities, such as waterskiing, playing in nature, and going to the beach, were not associated with increased connectedness to nature, despite involving contact with nature, which may be because of their emphasis on hedonia, although this is largely speculative. Thus, there is tentative evidence suggesting that placing an undue and undiscerning focus on any and all positive affect may be unwise.

Applications to OEE: Affect

Affect is an important determinant of connectedness. Positive affect has been shown to promote connectedness (e.g., Nisbet & Zelenski, 2011), whereas negative affect diminishes it (e.g., Nisbet et al., 2011). In other words, the research on affect clearly suggests that any given OEE program will only be effective at increasing connectedness to the extent that it is experienced positively by participants. At the absolute least, it seems important that a program is not experienced as wholly negative. Still, the research suggests that there is value in considering nuances in similar types of emotions—once again, highlighting the importance of focusing on the underlying process. Ideally, OEE should focus on creating higher-order affective experiences—experiences consistent with elevation and eudaimonia, such as awe, curiosity, fascination, compassion, hope, etc.—because those may be the most likely pathway to influence connectedness.

4.2.5 Individual Differences that Influence Connectedness

Several individual differences are associated with connectedness. These individual differences include demographic characteristics (e.g., age, gender, race, & socio-economic status), personality, and various worldviews (e.g., attitudes, beliefs, & values). OEE practitioners may wonder whether OEE programming needs to be tailored to different groups (i.e., whether certain individual differences moderate the effectiveness of OEE programming on connectedness). Additionally, OEE program evaluators may also wonder what extraneous influences should be accounted for when evaluating the success of a program (i.e., individual differences for which we should control). The research on individual differences outlined in this section will hopefully be informative for both considerations.

4.2.5.1 Demographics

As antecedents to connectedness, demographics are important because they can inform decisions about whether programs need to be tailored to different demographic groups. Although, to set expectations at the outset of the section, there may be little evidence to warrant tailoring programs in any substantial manner.

Age

Age may influence individuals' sense of connectedness. Studies with adults indicate that age is either positively associated with connectedness (Beery, 2013; Burbach et al., 2012; Diessner et al., 2018; Harvey et al., 2016; Lumber et al., 2017; Nour et al., 2017; Sanguinetti, 2014; Zhang et al., 2014, S1–2) or not at all (Brown, 2017; Bruni et al., 2008; Dutcher et al., 2007; Mayer & Frantz, 2004; Swami et al., 2016; Unsworth et al., 2016, S1–2; Walters et al., 2014; Weinstein et al., 2009, S1–3; Whitburn et al., 2019). In other words, studies with adults do not tend to find an actively negative relationship between age and connectedness. In contrast, studies with school-aged children indicate the opposite; connectedness tends to be higher among younger children than older children (Braun & Dierkes, 2017; Crawford et al., 2017; Larson et al., 2018; Liefländer et al., 2013). Together, this pattern of results suggests that children temporarily grow out of their connection to nature, so to speak, as they enter adolescence and young adulthood, after which they begin to re-connect with nature (see Hughes et al., 2019, for evidence from data across the lifespan).

Although age, like other demographic characteristics, may moderate the effect of participation in outdoor activities, there is not much evidence to suggest that this is the case. The authors know of only two studies in which age moderated any effects. In one, regular participation in outdoor activities—versus nonregular participation—may only matter for older age groups (Beery, 2013). In another, much more

relevant to OEE, the short-term effectiveness of OEE programs was slightly different for different age groups (Braun & Dierkes, 2017). Shorter programs were more effective for older participants than younger participants, and longer programs were more effective for younger participants than older participants (Braun & Dierkes, 2017). Unfortunately, this study included a number of tests without statistical adjustment and did not report in statistical detail; therefore, it is hard to interpret these results meaningfully. Thus, there may not be a reason to tailor the psychologically informed elements of OEE to different age groups beyond those dictated by differences in developmental and educational needs amongst different ages and by common sense.

Gender

Gender might also affect connectedness, although the evidence is not as easily interpreted. For the most part, the evidence often suggests that women feel more connected to nature than men (Beery, 2013; Bruni & Schultz, 2010, S3; Crawford et al., 2017; Hughes et al., 2019; Mayer et al., 2009, S2; Nour et al., 2017; Pensini et al., 2016; Sanguinetti, 2014; Schultz & Tabanico, 2007, S3–4; Spendrup et al., 2016; Swami et al., 2016; Zhang et al., 2014, S1) than it suggests men feel more connectedness than women (Larson et al., 2018; Wyles et al., 2019). However, many studies also report no differences between men and women (Barton et al., 2016; Bruni & Schultz, 2010, S1–2; Bruni et al., 2008; Davis & Stroink, 2016a, b; Di Fabio & Kenny, 2018; Diessner et al., 2018; Duffy & Verges, 2010; Frantz et al., 2005; Harvey et al., 2016; Liu et al., 2019; Lumber et al., 2017; Mayer & Frantz, 2004, S1–2; Mayer et al., 2009, S1 & S3; Unsworth et al., 2016, S1–2; Vess et al., 2012; Weinstein et al., 2009, S1–3; Whitburn et al., 2019; Zhang et al., 2014, S2).

Thus, it is hard to say whether women and men differ in their connectedness; at the very least, men are not likely to feel more connected than women. There is also no evidence that gender moderates any effects in any studies reporting on gender and connectedness (e.g., Mayer et al., 2009; Duffy & Verges, 2010; Vess et al., 2012; Capaldi et al., 2014) cited in this chapter. This suggests that OEE's impact on connectedness may not differ between women/girls and men/boys and that there is likely no need to create unnecessarily gendered programming.

Other

There are three currently understudied demographics—level of education, race/ethnicity, and socioeconomic status—which may be valuable to note in this review. Level of education might not influence connectedness (Beery, 2013; Dutcher et al., 2007; Mayer & Frantz, 2004, S1; Nour et al., 2017; Walters et al., 2014; Whitburn et al., 2019); however, a few correlational studies have found that connectedness

decreases as the level of education increases (Brown, 2017; Sanguinetti, 2014). Similarly, there might be no relationship between race/ethnicity and connectedness (Weinstein et al., 2009, S1–3; Whitburn et al., 2019; Taylor, 2018), but one study suggests that white participants report greater connectedness compared to non-white participants (Larson et al., 2018). Likewise, there might be no relationship between connectedness and socioeconomic status (Wyles et al., 2019) or income (Beery, 2013; Dutcher et al., 2007; Mayer & Frantz, 2004; Walters et al., 2014), but yearly income and homeownership were negatively associated with connectedness in one study (Whitburn et al., 2019). Thus, it would be premature to draw conclusions about the effects of level of education, race/ethnicity, and socioeconomic status on connectedness.

However, while there is limited evidence to suggest there are meaningful differences in the ability to connect to nature across these demographic groups, this is not to suggest there are no differences in access to nature across these groups. The chapter emphasizes that contact with nature is an important antecedent to connectedness, suggesting that a lack of access to nature may affect connectedness. Inequities experienced by these groups should be considered by OEE practitioners when designing programs to be aware of the power and privilege dynamics present when working with historically underrepresented learners. Further, quantitative research may not fully capture the experiences of intersecting identities on connectedness. Future work in psychology and OEE on individual differences should take an intersectional and critical approach to these topics. Finally, insights from OEE practitioners and evaluators might be able to provide valuable contributions to our understanding of the influence that these demographic characteristics might have on connectedness.

Applications to OEE: Demographics

There is evidence that our age influences how connected to nature we feel. There is also relatively ambiguous evidence that gender might influence connectedness, although it is possible that there is no effect. However, demographics seem primarily important to consider in the context of OEE because they might affect how different individuals experience the same OEE program. At present, there is little evidence to suggest that this is the case. Still, program evaluators may want to remain cautious and control for differences in gender composition between various studies, particularly when comparing different programs. For example, women/girls *may* be more likely to self-select into programs that focus on nurturing nature or artistic engagement with nature (both related to research highlighted in the activities section), and men/boys might be more likely to self-select into programs that focus more on science education. Thus, when comparing such programs, it might be necessary to rule out the influence of differences in gender composition if the programs appear to have a different effect on connectedness.

4.2.5.2 Personality

Individuals' personality characteristics influence connectedness. Like the point illustrated in the section on gender, these factors seem primarily important to consider in program evaluation, at least to the extent that individuals with certain personalities are more likely to self-select into one type of program.

The relation most frequently reported in the literature is a positive association between openness to experience and connectedness (Brick & Lewis, 2014; Di Fabio & Bucci, 2016; Forstmann & Sagioglou, 2017; Lee et al., 2015; Nisbet et al., 2009; Nour et al. 2017; Richardson & Sheffield, 2015; Tam, 2013; Zhang et al., 2014, S1). It also appears that connectedness is positively associated with agreeableness (Brick & Lewis, 2014; Di Fabio & Bucci, 2016; Nisbet et al., 2009; Tam, 2013; Zhang et al., 2014, S1) and conscientiousness (Brick & Lewis, 2014; Di Fabio & Bucci, 2016; Forstmann & Sagioglou, 2017; Nisbet et al., 2009; Tam, 2013; Zhang et al., 2014, S1). Finally, comparatively limited evidence suggests that other facets of personality—humility (Lee et al., 2015; Brick & Lewis, 2014), emotionality (Brick & Lewis, 2014; Tam, 2013), extraversion (Nisbet et al., 2009, S1; Tam, 2013; Zhang et al., 2014, S1) and (less) neuroticism (Zhang et al., 2014, S1)—are also positively associated with connectedness.

Applications to OEE: Personality

Individuals' personalities affect their sense of connectedness to nature. Although personality cannot be feasibly targeted for intervention and is so varied that it is not practical to tailor programs to different personality profiles, it may still be important to keep the association between personality and connectedness in mind for OEE. Specifically, it is likely most important for program evaluators. Much like gender, there is the possibility that individuals with certain personality characteristics might self-select into one type of program over another. For example, if one were to compare a more traditional OEE experience to a less traditional and more overtly non-mainstream program (e.g., "outdoor mindfulness environmental education"), it would be wise to account for—or at least consider—whether one program has more individuals who are higher in openness to experience. In this case, the mindfulness program seems like it might attract more individuals who are high in openness to experience and, based on the research above, are, therefore, more likely to already be high in connectedness.

4.2.5.3 Worldviews

Worldviews—that is, our beliefs, attitudes, orientations, and values (Clayton & Myers, 2015)—influence connectedness. Echoing the preceding sections, research in this domain is informative because it can identify potential moderators of the effects of OEE programming on connectedness. However, research on individual

differences in worldviews has the potential to provide a unique set of insights relative to demographics and personality. Namely, while demographics and personality are largely immutable and not practical points of intervention, worldviews have a greater degree of mutability and, therefore, may pose additional leverage points in efforts to enhance connectedness. In other words, reviewing this research is valuable because it may identify additional, indirect avenues toward increased connectedness (e.g., focusing on increasing OEE participants' reliance on systems thinking or their tendency to appreciate natural beauty).

Perhaps intuitively, positive environmental beliefs are positively associated with connectedness (Brick & Lewis, 2014; Bruni & Schultz, 2010; Clayton et al., 2011, S1; Davis & Stroink, 2016a, b; Davis et al., 2011; Frantz et al. 2005; Lee et al., 2015; Mayer & Frantz, 2004, S1, 2; Nisbet et al., 2009, S1; Whitburn et al., 2019). Additionally, there is a positive association between connectedness and the tendency to appreciate natural beauty (Capaldi et al., 2017, S1–2; Diessner et al., 2018; Lumber et al., 2017; Zhang et al., 2014, S1–2), more liberal political orientation (Dutcher et al., 2007; Nour et al., 2017), and a more empathic disposition (Di Fabio & Bucci, 2016; Di Fabio & Kenny, 2018; Mayer & Frantz, 2004, S2 & S4). In contrast, connectedness is negatively associated with more conservative political orientations (Brick & Lewis, 2014), more authoritarian views (Nour et al., 2017), a greater orientation toward consumerism (Mayer & Frantz, 2004, S4) or materialism (Hedlund-de Witt et al., 2014), and (among women) personally ascribing to the feminine beauty ideal (Scott, 2010, S1–2).

Connectedness is also positively associated with worldviews that are associated with self-transcendence. Specifically, connectedness shares a positive association with self-transcendent values (Tam, 2013), connecting to something greater—for example, connectedness to one's community (Sanguinetti, 2014) and connectedness to humanity (Lee et al., 2015; Lengieza et al., 2021)—and greater moral expansiveness (Crimston et al., 2016). Moreover, connectedness is often positively associated with non-self-interested concern for nature (e.g., biospheric concern; Davis & Stroink, 2016a, b; Mayer & Frantz, 2004, S4–5). In contrast, connectedness to nature is often not associated with self-interested concern for the environment (e.g., egoistic concern; Davis & Stroink, 2016a, 2016b; Duffy & Verges, 2010; Mayer & Frantz, 2004, S4; Schultz & Tabanico, 2007, S1–2)—and might even be negatively associated with such concern (Mayer & Frantz, 2004, S5; Schultz & Tabanico, 2007, S1)—and shares a negative association with self-enhancement values (Tam, 2013). Individuals' spirituality might also be positively associated with connectedness (Brown, 2017; Hedlund-de Witt et al., 2014). However, some studies report no effect (Vess et al., 2012, S1–3), and religious fundamentalism appears to be negatively associated with connectedness, although this was only under conditions of mortality salience (Vess et al., 2012). Lastly, individuals who are more prone to rely on systems thinking tend to report higher levels of connectedness (Davis & Stroink, 2016a).

In this chapter, we will not consider differences among more broad cultural world views (such as differences in Western ways of knowing and Indigenous knowledge systems) because such a discourse would fill an entire book on its own.

However, we do not want to diminish the importance of the effects of epistemological and ontological differences on relationships to the natural world. We would recommend that readers take the time to explore this rich body of literature.

Applications to OEE: Worldviews

This section suggests that the way we view the world impacts our connectedness. In the context of OEE, this might suggest that incorporating programming that targets any one of the worldviews noted above *might* also affect connectedness. Most relevant to OEE, programming aimed at increasing participant's appreciation for natural beauty (e.g., Capaldi et al., 2017), systems thinking (e.g., Davis & Stroink, 2016a), biospheric concern (e.g., Mayer & Frantz, 2004), or environmental attitudes (e.g., Nisbet et al., 2009) might spill over into increased connectedness as well. Additionally, it suggests the possibility of targeting more domain-general worldviews such as empathy (Di Fabio & Kenny, 2018), spirituality (Hedlund-de Witt et al., 2014), or even minimalism (i.e., as a contrast to consumerism; Mayer & Frantz, 2004) to support increases in connectedness.

However, it should be noted that there is an implicit causal assumption underlying these speculations, which needs to be investigated. It might be true that changes in systems thinking, for example, will *cause* changes in connectedness. But it is also possible that the associations reviewed in this section instead reflect those changes in connectedness will *cause* changes in these worldviews (see Schultz et al., 2004). Moreover, it is still possible that neither case is the reality. The associations in this section may merely reflect associations between connectedness and worldviews and some third variable, such as personality. Thus, while it is exciting to consider the possibility of simultaneously targeting systems thinking and connectedness—with the former reinforcing the latter—we would be wise to carefully evaluate the effectiveness of such practices before encouraging their widespread adoption.

Relatedly, there is little to no evidence—mostly out of a lack of research rather than reported null effects—that worldviews moderate the effects covered in this chapter. However, it is hard to shake the intuition that certain individuals may tend to experience the same activity differently. For example, individual differences in appreciating natural beauty might influence the effect of engaging with nature artistically (c.f., Bruni et al., 2017). Thus, when designing OEE programming to enhance connectedness using artistic engagement with nature, one should foster an appreciation of natural beauty as a precursor to artistic engagement with nature, at least in theory. However, more evidence is necessary before such approaches should be adopted widely.

4.3 Empirical Psychological Research on Environmental Education and Connectedness

Some empirical studies have looked at the effect of environmental education, not necessarily exclusively OEE, on connectedness to nature. In general, studies tend to conclude that environmental education is associated with increases in connectedness (Braun & Dierkes, 2017; Cho & Lee, 2018; Crawford et al., 2017; Dopko et al., 2019; Johnson-Pynn et al., 2014; Lankenau, 2018; Liefländer et al., 2013; Mayer & Frantz, 2004; Otto & Pensini, 2017; Sellmann & Bogner, 2013; Mullenbach et al., 2019; Pirchio et al., 2021). There are, however, some exceptions, with some studies showing no effect of participation in environmental education (e.g., Ernst & Theimer, 2011). Importantly, the literature evaluating the effects of various educational interventions often lacks control groups and has other methodological and statistical limitations that make it especially important to consider insights found within environmental psychology (see Barrable & Booth, 2020 for a similar critique).

Moreover, beyond methodological limitations, there is much that the literature on OEE and connectedness has yet to fully reveal. For example, we do not know what kinds of programs—broad versus specific, intermittent versus back-to-back, commute versus overnight, etc.—will lead to the largest increases in connectedness. However, there is limited evidence that longer programs might be more effective at fostering connectedness (e.g., Braun & Dierkes, 2017; Johnson-Pynn et al., 2014). This effect may be attributable to several things, such as more impactful content, more immersion, or some other element that differs between longer and shorter programs, but the exact reason for this effect requires further research.

Once again, knowing the underlying process of this effect would only be beneficial. If it turns out that longer programs result in greater connectedness because longer programs simply afford more contact with nature, then merely extending programs should effectively harness this effect, and conversely, shorter programs will always fall short. However, it could turn out that the reason longer programs are more effective is that, by having more time, they are stochastically more likely to involve some experience that is meaningfully impactful for some individual. If this were the case, then it would not be enough, or rather would not be efficient, to simply extend the length of programs. Instead, it would be wise to deliberately create experiences that are meaningful to participants (e.g., eudaimonic reflection) rather than relying upon chance. More importantly, this would imply that one need not artificially lengthen OEE programs and that shorter, potentially more accessible, or practical (c.f., Braun & Dierkes, 2017) programs might be able to be made more impactful.

4.4 Discussion

The psychological research on the predictors of connectedness to nature can offer OEE planners and practitioners a wealth of knowledge. We have offered summaries throughout the chapter to highlight the application of each specific subset of research to OEE. Here, we provide some additional broader conclusions from this chapter, which can be broken into implications for program planning and evaluation.

4.4.1 Planning

One noteworthy over-arching concern is how we can make OEE more accessible in an increasingly urbanized world. As the world becomes more urbanized, natural spaces dwindle, as does access to such spaces. While some communities can continue to afford access to wild and natural spaces, many communities cannot, especially those found in more urban environments. Thus, it is particularly important to consider how we can make effective OEE accessible to all communities.

While urban communities may not have access to the same types of nature as other communities, the promise shown by technologically-aided (e.g., video and perhaps VR as well) means of experiencing nature (Ahn et al., 2016) represents a hopeful opportunity to make 'nature' more accessible. Yet, it is undeniable that urban communities may not have access to the same technological tools as other communities. Still, the research suggests, at the very least, that efforts to secure funding to bring nature into the urban OEE classroom via technological advances would be well justified.

Additionally, beyond technology, other insights may be important to consider in attempts to make *effective* OEE more accessible in an urbanized world. Indeed, while research suggests that the quality of the natural space is an important determinant of connectedness to nature (Wyles et al., 2019), there are a number of potential ways to further enhance the experience. For one, immersion seems to influence the effect that situations have on connectedness (Weinstein et al., 2009). Thus, any practice that enhances learners' immersion in *nature* should make the experience all the more effective. Similarly, the activities in which one engages while in nature make a difference. Things as simple as deliberately noticing nature (Passmore & Holder, 2017), caring for nature (Whitburn et al., 2019), or even mindfully learning about nature (c.f., Wang et al., 2016) should further enhance the experience. Additionally, meditation seems capable of enhancing connectedness even in the absence of nature and, therefore, poses an interesting possibility of having home-based activities supplement urban OEE programs. In sum, there are several ways that the efficacy of OEE programs can be enhanced in terms of connectedness to nature. We hope that this chapter will help program planners identify potential avenues for increasing accessibility to connectedness-fostering OEE programs.

This, however, raises another point that cuts across the entire chapter—the importance of considering the *process* that underlies an activity or program feature's effect on connectedness. Once again, we stress the importance of considering *why* an activity should affect connectedness before implementing it. For example, suppose one is considering assigning meditation-based 'homework' as part of an OEE program. In that case, one should consider: "What is this meditative practice going to do that will lead to greater connectedness?" or "Is this meditative practice going to do anything that might inadvertently hinder connectedness?"

Suppose the answer is, for example, "Research shows that this specific form of mediation will improve participants' mood and soften their sense of self". In that case, the practice is easily justified because it creates a desirable chain reaction; both positive mood (Capaldi et al., 2014) and softened self–other boundaries (c.f., Hanley et al., 2017) are positively associated with connectedness to nature. In theory, the meditation should increase mood and soften self–other boundaries, which should, in turn, result in greater connectedness. In contrast, suppose the answer is, "Research shows that this specific form of mediation enhances public self-awareness and acting with awareness". In this case, the activity would be unwise because the chain reaction is undesirable; public self-awareness seems to work against connectedness (Lengieza & Swim, 2021), and "acting with awareness" is one of the facets of mindfulness that is not associated with connectedness (Barbaro & Pickett, 2016). Thus, when selecting activities that should enhance the efficacy of urban OEE programs, it is important to consider the underlying process—the chain reaction, as it were—to ensure that the chosen activity or program feature is well-considered.

The final point worth mentioning with program planning is to reiterate that a learner's subjective psychological experience is just as, if not more, important than "objective" reality. In light of findings that 'higher quality' natural areas are more positively impactful on connectedness or that greater immersion leads to greater connectedness, finding the *objectively* highest quality and most immersive natural space may be tempting. However, such a focus would be misguided. Moreover, to illustrate, a personal anecdote seems most effective as an example. The first author recalls setting up a study where some participants were to walk in some of the wooded trails found within the Penn State Arboretum. He was surveying the trails with his contact at the arboretum, B., when B. casually noted that "unfortunately, there aren't too many places here where you can't see a university building or someone's house from the trail. But I'll tell you. I don't think that your students will notice. We have volunteers help out on the weekends, and I swear, they are always commenting that they feel like they're in the middle of nowhere. Even though there's a main road only a few hundred feet on either side."

What B. observed anecdotally exemplifies that what counts as high quality and immersive nature for some is often different from objective reality. Even more, it highlights that for individuals who are already connected to nature—such as B., who worked in a profession that stems from a love of nature, such as OEE professionals—our standards may be higher, or at least out of touch, with the public's experience of the same place. It is entirely likely that for someone who has spent their entire childhood in an urban environment, the small but well-vegetated park

across the street might *feel* like "wild nature". However, the only way to *know* how learners perceive a space or activity is to ask them. Thus, this serves as a nice segue into the second set of considerations: Evaluation.

4.4.2 Evaluation

It is impossible to strive for a goal without having some means of evaluating one's progress toward that goal. Moreover, progress toward a goal is only most effective when one deliberately and thoughtfully attempts to determine which strategies are working and which strategies are not. Thus, if promoting connectedness to nature is to persist as one of OEE's goals, programs must evaluate their progress toward that goal and attempt to document which strategies are and are not working. Thus, empirical program evaluation should be a central part of OEE's attempts to increase connectedness to nature. Here, we offer some additional considerations specific to OEE program evaluation.

More than once in this chapter, we noted that research on OEE can not only benefit from considering the psychological literature on connectedness but can also potentially inform that very literature itself. Thus, we come from the perspective that OEE evaluation efforts should strive for the highest level of evaluative rigor using methods and analyses appropriate to the program and evaluation goals. From a quantitative perspective, it would be important that evaluation efforts make attempts to include some form of a control group. Ideally, this would be an active control group, although it is often only possible to use a passive control group (e.g., waitlist controls). It would also be ideal for evaluation efforts to include random assignment to treatment and control, wherever possible. In cases where random assignment is simply not possible, it is incredibly important to consider carefully—and ideally, rule out—the possibility of self-selection creating the false appearance of program success (as noted in preceding sections). From a qualitative perspective, using appropriate open-ended written and verbal assessments is key, along with following up such assessments with a formalized coding scheme to distill the main takeaways from participants' experiences. Finally, mixed methods could be used to draw on the unique benefits of both quantitative and qualitative means of evaluation. Together, these considerations are especially important because, without adequate empirical rigor, it is impossible to know which strategies are working and which strategies are not. We want to be confident that the strategies we are incorporating are actually effective. Relatedly, evaluation efforts will be most informative if they consider the *process* (as emphasized above). The better we document which program elements work and *why* those processes work, the more effectively we can implement those strategies into other programs.

4.5 Conclusion

The intersection of environmental psychology and OEE represents the potential for a symbiotic relationship whereby theory on connectedness to nature can improve OEE programs, and applications of such theory in OEE can, in return, increase the robustness of the theory. In this chapter, we focused on the first part of this interdisciplinary relationship by showing how psychological insights can aid OEE programs in increasing connectedness in their learners. In each section of the chapter, we highlighted ways to apply these insights to OEE programs and emphasized the importance of carefully considering *why/how* a program feature will promote connectedness (i.e., process) to ensure well-justified program planning.

The insights highlighted in this chapter present many exciting possibilities for the future of OEE. Specifically, literature has shown that contact and engagement with nature (e.g., either first-hand or virtually) as well as reflective programming (e.g., meditation, mindfulness, introspection, eudaimonic reflection) and meaningful activities (e.g., noticing nature or nurturing nature) can contribute to increases in connectedness to nature. Any number of these elements can likely be incorporated into OEE programming with ease and will hopefully aid in attempts to promote connectedness to nature. Overall, the plethora of ways to promote connectedness lends itself to the variety and creativity of OEE programs and suggests the beginning of a productive interdisciplinary relationship between environmental psychology and outdoor environmental education.

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