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Occupational Health Science (2025) 9:29–56
https://doi.org/10.1007/s41542-024-00203-0

REVIEW

Branching Out: The Nonwork Nature and Employee Outcomes (NEO) Model

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Received: 26 July 2023 / Revised: 8 July 2024 / Accepted: 5 August 2024 /
Published online: 21 August 2024

Abstract

Nature is considered a basic human need, with a large and growing body of literature demonstrating the advantages of exposure to nature and natural environments. Yet, this line of research has been largely disconnected from the organizational sciences, despite the widespread potential benefits that nature can have for employees. Emerging organizational scholarship has emphasized nature exposure in the work domain, and we argue that it is important for scholars to realize the relatively untapped potential of *nonwork* nature exposure for promoting positive employee outcomes. We integrate theories and research across environmental psychology and organizational science disciplines and introduce the nonwork nature and employee outcomes (NEO) model. The NEO model explicates how exposure to nature in the nonwork domain can impact employee outcomes related to health and well-being, job performance, job attitudes, and interpersonal interactions. Nonwork nature exposure is expected to exert a greater influence on employee outcomes than nature exposure at work and is theorized to enable a serial mediation process of facilitating recovery experiences (i.e., psychological detachment, relaxation, control, mastery), followed by the replenishment of potential energies (i.e., cognitive, emotional, physical, and prosocial energies), which in turn relate to employee outcomes. Key resources (i.e., perceptions of restorativeness) are presented as moderators. Macro resources (i.e., nature exposure at work, workplace benefits and support, physical safety, accessibility of nature, and culture) and other suggestions for future research are also discussed. The NEO model presents unique opportunities to advance interdisciplinary research, theory, and practice.

Keywords Nature · Well-being · Job performance · Job attitudes · Interpersonal interactions · Recovery · Energy

Extended author information available on the last page of the article

> "To the body and mind which have been cramped by noxious work or company, nature is medicinal and restores their tone" (Emerson, 1836).

Nature as a Human Need

Currently, about a third of Americans report not being able to function due to extreme stress (Bethune, 2022; American Psychological Association [APA], 2022). This raises concerns about the declining health of the American workforce and warrants an urgent need to identify effective ways to protect and promote worker health and well-being (American Psychological Association [APA], 2020; U.S. Department of Health and Human Services, 2022). Although most of modern life is spent indoors, the notion that spending time outside is "good for you" has persisted throughout time (Devlin, 2018), and recent research suggests that humans have a deep-rooted need for nature (Schiebel et al., 2022). Nature exposure can improve individuals' cognitive functioning, bolster mood, reduce stress, and benefit both physical and mental health (e.g., Frumkin et al., 2017; Hartig et al., 2014; McMahan & Estes, 2015; Russell et al., 2013; Stevenson et al., 2018; Twohig-Bennett & Jones, 2018), all of which have implications for working populations who may be especially susceptible to lapses in attention, decrements in mood, and health-related consequences due to the demands of their job. Yet, this line of research has been largely disconnected from the organizational sciences, with new theoretical advancements focusing specifically on nature exposure *at work* (Klotz & Bolino, 2021). We integrate theory and research from the environmental psychology and organizational science literatures to introduce a new model that outlines how and why nature exposure during *nonwork* time is particularly advantageous to employees and organizations.

Organizational research on the influence of nature on employees is lagging behind other academic disciplines (e.g., environmental psychology, neuroscience, public health) as well as organizational practices. Some organizations have established programs to facilitate employee connections to nature and the outdoor environment, such as L.L. Bean's *Be an Outsider at Work* program (L.L. Bean, 2024), Patagonia's *Let my People Go Surfing* philosophy (e.g., Chouinard, 2006), or REI's *Yay Days* (REI Staff, 2015). The discrepancy between interest in nature in business and practice, without corresponding empirical studies, has recently been acknowledged (e.g., Klotz & Bolino, 2021; Tang et al., 2023a), and we agree that organizational science scholars should be at the forefront of this movement by recognizing nature as a basic human need and a valuable tool that can enable employees to flourish.

Contributions of the Nonwork Nature and Employee Outcomes (NEO) Model

We introduce the NEO model to specify how and why nature exposure during nonwork time can influence employee outcomes. Compared to nature models that are firmly situated in the work context (e.g., biophilic work design model; Klotz & Bolino, 2021), we center the NEO model on employee outcomes stemming from *nonwork* exposure to nature and highlight how recovery experiences and energies replenished in one domain (i.e., home) can influence outcomes in a different domain (i.e., work). Of note, recent work has called for a greater focus on nonwork nature and demonstrated how its benefits can transfer back to the work domain (e.g., Klotz et al., 2023). We argue that nonwork nature exposure is even more restorative than nature exposure at work, given the greater availability of time and discretion individuals have over how they spend leisure time. Therefore, the primary contribution of the NEO model is its emphasis on both *nature exposure* and the *nonwork* domain.

Next, we integrate tenets of the biophilic work design model (Klotz & Bolino, 2021) and attention restoration theory (ART; Kaplan & Kaplan, 1989) with recovery theory (Sonnentag and Fritz, 2015) to propose a serial mediation process that describes how nonwork nature exposure uniquely promotes each of the key recovery experiences which then lead to the replenishment of energies. ART is considered the "status quo" framework for describing the restorative effects of nature, though it focuses exclusively on *cognitive* restoration, leading scholars to invite research that considers "additional pathways to restoration" (Joye & Dewitte, 2018, pg. 7). The recovery from work stress literature has proliferated within the organizational sciences across the last decade, and although there are nods to recovery activities occurring in nature (e.g., outdoor walks), this stream of science has largely remained separate from nature research in environmental psychology despite the conceptual overlap between the two (Korpela et al., 2015). More research on recovery facilitators, particularly during nonwork time, are also needed (Steed et al., 2021). As such, we integrate environmental psychology with occupational health and work-nonwork scholarship to build the NEO model. This integration allows us to provide potential solutions to the criticisms of attention restoration theory (Joye & DeWitte, 2018) thereby providing some relief to the field's current theoretical standstill.

In addition, we expand upon the biophilic work design model by identifying specific categories of employee outcomes that are expected to result from nonwork nature exposure and its relationship with recovery experiences and replenished potential energies. Theoretical and empirical justifications are provided for the assertion that nonwork nature exposure will conjure benefits, above and beyond nature exposure at work, that influence employee health and well-being, job performance, job attitudes, and interpersonal interactions. Through this extension, we respond to calls for further investigation into the recovery-performance relationship (e.g., Steed et al., 2021) as facets of performance have been relatively understudied compared to health and well-being outcomes in the recovery literature, but are of particular interest to organizations. We believe this elaboration will facilitate extensive

opportunities for future research investigating nonwork nature as a potential intervention target that can simultaneously promote worker health and well-being as well as organizational outcomes.

Finally, we present boundary conditions in the NEO model to identify which individuals and within which contexts the impacts of nonwork nature may be the most pronounced. By considering different levels, we identify proximal variables (i.e., perceived restorativeness; key resources) as potential moderators, and present more distal variables (i.e., nature exposure at work, workplace benefits and support, physical safety, accessibility of nature, culture; macro resources) that are worthy of consideration in future work. In response to calls to evaluate nature exposure in different microenvironments (e.g., home, work, school; de Keijzer et al., 2016), we also discuss the interplay between nature exposure both during nonwork *and* work time to capture a more realistic picture of working individuals' experiences across multiple domains.

Theoretical Frameworks Relevant to the NEO Model

Psychoevolutionary Stress Reduction Theory

Ulrich's (1983) psychoevolutionary stress reduction theory (SRT) stipulates that exposure to nature can reduce psychological and physiological reactions to stress. SRT has roots in the biophilia hypothesis, which states that humans have an inherent affinity for natural environments and desire to be in nature (Ulrich, 1993; Wilson, 1984). Ulrich (1993) argued that aspects of the natural environments (e.g., vast views, access to food and water) were evolutionarily advantageous by enabling humans to relieve stress and regain energy. Public health perspectives have also acknowledged the role of stress relief in explaining the benefits of nature (Hartig et al., 2014). We apply the general stress reduction premise of SRT to describe employee-specific experiences of recovery from work stress following nonwork nature exposure.

Attention Restoration Theory (ART)

Since its development, ART has been the dominant theoretical framework for understanding the restorative effects of nature exposure. ART posits that nature exposure restores attentional resources (Kaplan & Kaplan, 1989). Akin to William James' notion of "voluntary attention" (James, 1892), directed attention is considered a finite and effortful type of attention that enables executive functioning (e.g., problem-solving, planning, self-monitoring, attention switching; Kaplan, 1995). Directed attention on tasks requires mental effort and eventually leads to attentional fatigue, characterized by distractibility and impaired cognitive functioning and performance. This attentional fatigue is theorized to be restored by spending time in natural environments (Kaplan & Kaplan, 1989), namely those that engender four key experiences – being away, soft fascination, extent, and compatibility (Kaplan, 1992, 1995), which are presented as moderators of the NEO model.

Biophilic Work Design Model

Thirty years ago, environmental psychologist Rachel Kaplan published *The Role of Nature in the Context of the Workplace* to apply ART to work settings (Kaplan, 1993). Kaplan (1993) argued that exposure to nature can alleviate mental fatigue and improve employees' effectiveness at work. These ideas were clarified and introduced to the organizational sciences by Klotz and Bolino (2021) in their paper proposing the biophilic work design model, which identifies how the depth and scope of employees' nature exposure – specifically at work – determines the restoration of potential cognitive, emotional, physical, and prosocial energies (i.e., energies that have yet to be expended; Klotz & Bolino, 2021; Quinn et al., 2012). We view the biophilic work design model as a foundational theory that bridges scholarship between environmental psychology and the organizational sciences and extend its tenets to propose a new model for understanding the unique role of *nonwork* nature exposure for employee outcomes.

Recovery from Work Stress

An important thread that connects organizational science to nature-related investigations is the recovery from work stress literature, which has roots in job stress and resource theories (e.g., Sonnentag et al., 2022). Recovery is defined as an unwinding process that restores and stabilizes employees' psychobiological systems that have been activated by workplace stressors (Meijman & Mulder, 2013; Steed et al., 2021). Effectively recovering from work stress is believed to replenish resources, like energy, and reduce the harmful effects of work-related stressors (Sonnentag and Fritz, 2015; Sonnentag et al., 2017). Scholars have called attention to the role of nature for recovery from work stress (Agolli & Holtz, 2023; Korpela et al., 2015), with Sonnentag and colleagues (2017, pg. 372) suggesting that "engagement in natural environments seems particularly suited to replenishing depleted resources". We focus our attention on the role of nonwork nature exposure and the resulting recovery experiences – psychological detachment (i.e., forgetting about work), relaxation (i.e., a calm low-activation state), control (i.e., autonomy in deciding what to do), and mastery (i.e., learning something new) (Sonnentag and Fritz, 2015) – that generate potential energies. Although nature is not an explicit component of recovery theory, the recovery literature provides a useful framework from which the restorative effects of nature can be understood. In the NEO model, nonwork nature exposure is theorized to be particularly restorative because of its unique ability to facilitate each of the recovery experiences.

Work-Home Resources Model

The work-home resources model describes the ways in which work and nonwork domains are linked via personal resources (ten Brummelhuis & Bakker, 2012) and provides another lens through which the influence of nonwork nature on employee outcomes can be understood. Contextual resources (i.e., those outside of the self; e.g., nature) are believed to be the "starting point for enriching work-home

processes" and can improve work outcomes via the generation of personal resources (i.e., those proximal to the self, e.g., energies) (Hobfoll, 1989; ten Brummelhuis & Bakker, 2012, pg. 549). We view nature in the nonwork domain as a contextual resource that enables recovery experiences, replenishes volatile personal resources (i.e., those that are fleeting and finite; energy), which can be stored as potential energies and used later (Quinn et al., 2012), such as when an individual returns to work after the weekend. We draw from the work-home resources model to identify how these resources will influence attitudinal (e.g., satisfaction), production (e.g., performance), behavioral (e.g., interpersonal interactions), and health and well-being outcomes. Finally, key resources (i.e., individual characteristics) and macro resources (i.e., characteristics of the broader economic, social, and cultural contexts) determine the extent to which an individual can draw upon contextual resources (ten Brummelhuis & Bakker, 2012) and are considered as boundary conditions in the NEO model that can facilitate or impair opportunities for nature exposure, and the extent to which benefits are derived.

The Nonwork Nature and Employee Outcomes (NEO) Model

By synthesizing theories from environmental psychology and the organizational sciences, we build an integrative model outlining the role of nonwork nature exposure on employee outcomes. The NEO model comprehensively depicts how and why exposure to nature during nonwork time can facilitate experiences of recovery, increase potential energies, and subsequently impact employee health and well-being, job performance, job attitudes, and interpersonal interactions at work (see Fig. 1).

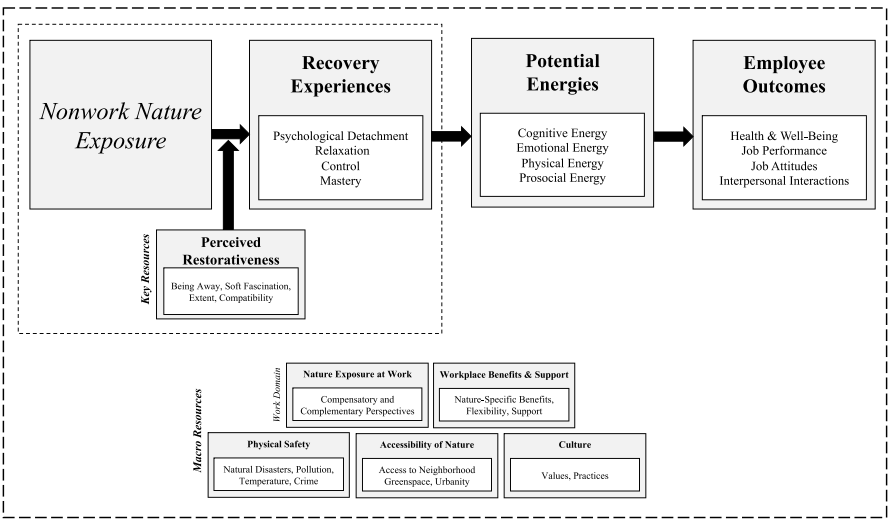

Fig. 1 The Nonwork Nature & Employee Outcomes (NEO) Model

Conceptualization and Unique Features of Nonwork Nature Exposure

Nature exposure is defined as direct physical and/or sensory experiences with the natural environment (e.g., Kamitsis & Francis, 2013; Wood et al., 2019). Our use of the terms "nature" and "natural environment" are intentionally broad considering the varied definitions that have been used in the extant literature (Holland et al., 2021). Nature can include environments with no indication of human presence (e.g., wilderness spaces), public natural spaces (e.g., hiking trails), built environments (e.g., urban parks), indoor environments (e.g., indoor plants), and/or nature simulations (e.g., virtual reality) (Hartig et al., 2014; Holland et al., 2021; Li et al., 2021; McMahan & Estes, 2015; Twohig-Bennett & Jones, 2018). Exposure to nature can engage any of the five human senses, and it is theorized that the engagement of more senses elicits greater restoration (Kaplan & Kaplan, 1989; Klotz & Bolino, 2021). Accordingly, we apply Klotz and Bolino's (2021) proposition that the energizing effects of nature vary according to the depth and scope of the nature exposure to similarly propose that the most restorative type of exposure to nonwork nature is the most direct form – being outside – followed by outdoors brought indoors (e.g., house plants), outdoors via a physical barrier (e.g., a natural view from a window), and representations of nature (e.g., photographs of nature; Klotz & Bolino, 2021).

> Proposition 1: Nonwork nature exposure that is more direct will elicit greater recovery experiences, subsequent energy restoration, and resulting employee outcomes.

As discussed, several theories have been developed to explain the benefits of nature, and while each have different points of emphasis (e.g., evolutionary basis of stress relief in SRT; restoration of attention in ART; restoration of potential energies in the biophilic work design model), the common thread is that there is something special about the natural world and its impact on human functioning. Although recovery and restoration can be achieved by other means (e.g., sleeping, going to a museum), it has been theorized that nature exposure has an "aesthetic advantage" and uniquely offers both pragmatic (e.g., improved cognitive functioning and health) and spiritual benefits (e.g., Kaplan & Kaplan, 1989; Ohly et al., 2016).

A large body of empirical work has demonstrated the benefits of exposure to natural settings compared to urban settings (e.g., Berman et al., 2008; Hartig et al., 2003), as well as the added benefits of engaging in activities, like exercise, in natural outdoor environments compared to indoors (Wicks et al., 2022). Natural environments are considered inherently enjoyable and preferred over built or urban settings (Kaplan, 1995; Ulrich, 1983; Wilson, 1984), which has some empirical support (e.g., Herzog et al., 2003; Kaplan et al., 1972; Van den Berg et al., 2003). Additionally, neuroscience research has demonstrated how exposure to nature decreases activation in stress-related regions of the brain (i.e., the amygdala; Sudimac et al., 2022), reduces rumination (Bratman et al., 2015), and shifts the brain to a low-effort state (Hägerhäll et al., 2015). Prior research has also demonstrated that individuals believe outdoor activities are the most useful for helping them recover from work stress (Korpela & Kinnunen, 2011). Taken together, we posit that nature exposure

– particularly during nonwork time – is uniquely able to facilitate each of the key recovery experiences, which in turn restores potential energies, and can improve employee health and work-related outcomes.

Beyond our consideration of nature as a salient contextual resource for employees, we also emphasize *nonwork* nature as being especially conducive to recovery experiences. We define the nonwork domain as an individual's home life, outside of work hours (e.g., days off, before and after the workday, vacations). Recovery – a key component of the NEO model – is traditionally conceptualized as something that occurs during "off-job" leisure time (Sonnentag and Fritz, 2015), and although some scholars have considered recovery during leisure time at work (e.g., lunch breaks; Kim et al., 2017; Sianoja et al., 2018), we focus exclusively on nonwork recovery experiences that are separate from work, as others models can be used to understand the influence of nature contact during the workday (i.e., the biophilic work design model; Klotz & Bolino, 2021).

In addition, recovery research has largely focused on barriers to recovery (e.g., job demands), with considerably less work focused on facilitators of recovery (e.g., resources), particularly resources outside of the work domain (Demerouti et al., 2009; Steed et al., 2021). Home-based contextual resources may be particularly important for promoting rich and lasting recovery experiences (Steed et al., 2021). Moreover, organizational nature-based interventions tend to have small or mixed effects (Gilbert et al., 2018; Gritzka et al., 2020), suggesting that the potential benefits of nature exposure for employee outcomes may not be realized until a greater emphasis is placed on the nonwork domain.

Finally, our emphasis on the nonwork domain may also be advantageous for broader issues surrounding employee boundary management. We acknowledge and appreciate the value of nature exposure in the work domain (see Table 1), while also recognizing more critical perspectives suggesting that homelike workplaces (i.e., "the workplace as a place to work and live"; Leclercq-Vandelannoitte, 2021) may blur the boundaries between work and home life. On the one hand, homelike workspaces may be beneficial to workers. However, they may also be viewed as creating a sense of intensified obligation (whether inadvertent or intentional) to always be at work (Leclercq-Vandelannoitte, 2021). Although biophilic workplace designs are less explicitly "homelike" compared to other features (e.g., on-site gyms, meals), focusing on nonwork nature circumvents these potential concerns.

How Nonwork Nature Impacts Employees: Recovery Experiences and Energetic Resources

Nonwork Nature Will Enable Recovery Experiences

Experiences during nonwork should provide richer opportunities to recover from work stress, allowing individuals to derive the greatest benefits from nature exposure. It is important to disentangle nonwork nature exposure from theorizations about work nature exposure because nonwork nature experiences are arguably more beneficial to employees than what can be achieved at work. Specifically, compared

Table 1 Research Evaluating the Effects of Nature Exposure on Recovery Experiences, Potential Energies, and Employee Outcomes

Mediators and Outcomes in the NEO Model	Example Constructs	Example Papers
Recovery Experiences	Psychological detachment, relaxation, mastery, enjoyment	de Bloom et al., 2017; Korpela & Kinnunen, 2011; Sianoja et al., 2018
Potential Energies	Cognitive energy (e.g., performance on cognitive tasks, neural mechanisms underlying attention); emotional energy (e.g., positive and negative affect, emotions, awe); physical energy (e.g., vigor, exhaustion, depletion); prosocial energy (e.g., prosocial intention)	Bowler et al., 2010; Bratman et al., 2015; Gidlow et al., 2016; Hu & Meng, 2022; Kaplan & Berman, 2010; Klotz et al., 2023; Lee et al., 2018; McDonnell & Strayer, 2024; Meng & Wang, 2023; McMahan & Estes, 2015; Raanaas et al., 2011; Steidle et al., 2017
Health & Well-Being	Happiness, life satisfaction, depressive symptoms, anxiety, burnout, subjective health complaints, physiological indicators of health (e.g., blood pressure, heart rate variability), disease (e.g., stroke, coronary heart disease), all-cause mortality	Bergefurt et al., 2022; Bjørnstad et al., 2016; Gritzka et al., 2020; Hyvönen et al., 2018; Keniger et al., 2013; Korpela et al., 2017a; Korpela et al., 2017b; Perrins et al., 2021; Thompson & Bruk-Lee, 2019; Twohig-Bennett & Jones, 2018; Zhong et al., 2022
Job Attitudes	Job satisfaction, satisfaction with the physical workplace, organizational commitment	An et al., 2016; Dravigne et al., 2008; Hähn et al., 2021; Thompson & Bruk-Lee, 2019
Job Performance	Work effort, productivity, task performance, engagement, creativity	Brossoit et al., 2024; Conlin et al., 2021; Klotz et al., 2023; Lee et al., 2018; Palanica & Fossat, 2022; Plambech & Bosch, 2015; Tang et al., 2023b
Interpersonal Interactions	Cooperation, generosity, helping behaviors, prosocial behaviors	Meng & Wang, 2023; Tang et al., 2023b, Zelenski et al., 2015; Zhang et al., 2014

Note. Example papers reflect those that assessed work and/or nonwork nature exposure. Meng and Wang's (2023) study of awe in the workplace does not explicitly assess nature exposure, but earlier work (Hu & Meng, 2022) demonstrated that awe in the workplace can be elicited by nature, so it is included as an example

to what is possible during the workday, during nonwork, individuals typically have a) more time available for leisure, b) a wider variety of potential leisure activities, and c) greater discretion over how they spend their time. In this way, nonwork nature exposure is presumed to be greater in amount, quality, and flexibility, than what is possible at work.

For instance, although work breaks with nature exposure can be beneficial to employees (e.g., Conlin et al., 2021; Lee et al., 2018; Sianoja et al., 2018; Steidle et al., 2017), they are time-constrained because one must return to work within a reasonable time frame. During nonwork, individuals have greater discretion over the amount of time they choose to spend immersed in nature, as well as the activities they engage in, thereby facilitating the recovery experience of control. There is also a wider range of nature-related activities that can reasonably occur in the nonwork domain, compared to the work domain. Individuals may be more likely to seek out challenging outdoor experiences and exert effort to learn and grow in their nonwork time, enabling the recovery experience of mastery. For example, someone may choose to learn about mountain biking, landscape painting, or birdwatching during their nonwork time, though these activities would be harder to practice at work. It should also be easier for an individual to forget about work (i.e., psychological detachment), experience relaxation, and enjoy their leisure time when they are able to physically distance themselves from the workplace (e.g., Wang et al., 2018) and have more time available to do so. As another example, an employee would presumably experience greater psychological detachment and relaxation during a day spent at a waterfront (e.g., ocean, lake, river), allowing the individual to derive more of the benefits of nature than what could be possible during a 30-min outdoor break between meetings during the workday. Overall, the unique benefits of nature exposure are likely the most salient during nonwork time, when individuals have more discretion over how they spend their time, more opportunities for mastery experiences, and a greater ability to relax and detach from thoughts or worries about work, compared to when they are working.

> Proposition 2a: Nonwork nature exposure will be associated with greater recovery experiences of psychological detachment, relaxation, control, and mastery.
> Proposition 2b: The effects of nonwork nature exposure on recovery experiences will be greater than what can be achieved by nature exposure at work.

Recovery Experiences Will Enable the Restoration of Potential Energies

There are theoretical and empirical rationales for the links between nature exposure and potential energies (Klotz & Bolino, 2021; See Table 1). We apply this prior work to the NEO model and provide additional theoretical reasons for why nature, and the recovery experiences it elicits, should influence energy replenishment. Specifically, *cognitive potential energy* allows for directed attention and thought regulation, *emotional potential energy* enables emotion regulation and expression of positive moods and emotions, *physical potential energy* is a physiological type of energy and is defined by physical strength and feeling healthy, and *prosocial potential energy* involves resources needed to invest in the well-being of others (Klotz

& Bolino, 2021). Recovery inherently is a process that improves employee health by replenishing lost resources (Sonnentag and Fritz, 2015; Steed et al., 2021). Constructs like fatigue, exhaustion, vigor, and vitality tend to be evaluated as indicators of energy that are replenished from recovery experiences (e.g., Headrick et al., 2023; Sonnentag et al., 2017, 2022), though other specific types of energies – namely cognitive, emotional, physical, and prosocial – may also be derived by recovery experiences.

Regarding psychological detachment, forgetting about work should free cognitive energies that are no longer being used on work-related thoughts. Having a break from the demands of work should also enhance mood (i.e., emotional energy), enable individuals to rest and feel revitalized (i.e., physical energy), and may provide energy that can be used towards helping others (i.e., prosocial energy). Similarly, individuals who are relaxed should have more mental bandwidth, positive emotions, an inclination to help others, and feel healthier, because their bodies and minds are calmer and in a low-activation state, creating space for more energy storage. Next, autonomy is recognized as an innate human need (Deci et al., 1985; Sonnentag and Fritz, 2015; Ryan & Deci, 2000). When people lack control, they may expend their cognitive energy on identifying ways to regain a sense of control or exhaust their emotional energies from the negative emotions (e.g., frustration, anger) stemming from the lack of control. Autonomy is critical for health and well-being and may foster a sense of physical energy. Having a greater sense of control may also empower people to be prosocial. Mastery experiences are characterized as activities that allow for learning opportunities, personal growth, and achievement. Although mastery experiences can expend cognitive energies, the broadening of one's horizons that comes from mastery experiences may also expand cognitive energies. The satisfaction from having a sense of achievement or meeting goals can facilitate positive moods, emotions, and health (i.e., emotional and physical energies). It is also plausible that developing new skills and attaining goals may increase an individual's confidence and self-efficacy that could be directed towards helping others.

> Proposition 3: Nonwork nature exposure will be associated with greater potential cognitive, emotional, physical, and prosocial energies, via greater recovery experiences.

Potential Energies Will Influence Employee Outcomes

The recovery experiences and potential energies afforded by nonwork nature exposure are expected to in turn improve employee health and well-being, job performance, job attitudes, and interpersonal interactions. A foundational principle in the work-nonwork and recovery literatures is that experiences in one domain (e.g., nonwork) can transfer to another (e.g., work) (e.g., Allen & Martin, 2017; Geurts & Demerouti, 2003; Sonnentag et al., 2022; ten Brummelhuis & Bakker, 2012). This logic can be applied to the concept of energy. Quinn and colleagues' (2012) model of human energy defines "potential energy" as energy that is available, but not currently in use. The energies derived from nature have been theorized as potential energies, or the metaphorical "fuel" that can be stored and

used later (Klotz & Bolino, 2021). We argue that nature exposure during nonwork time is particularly reenergizing, via recovery experiences, and that this restored potential energy can later be applied at work. Therefore, nature exposure that occurs during nonwork time should also influence work-related outcomes, as demonstrated in previous studies (e.g., Brossoit et al., 2024; Klotz et al., 2023; Hyvönen et al., 2018), and we posit that the linking mechanisms are recovery experiences and the subsequent replenishment of potential energies. Illustratively, individuals who have greater nonwork nature exposure will be able to relax, detach from work, learn new skills, and have control over how they spend their time, thereby renewing their depleted resources and consequently equipping them with the energies required to feel healthy and well, perform adequately at work, experience favorable job attitudes, and have positive social interactions at work.

Health and Well-Being It is theorized that the ability to regulate one's thoughts (i.e., cognitive energy) and emotions (i.e., emotional energy) should allow individuals to be better equipped to cope with future stressors, use strategies like cognitive reframing (i.e., positive reappraisal; Riepenhausen et al., 2022), avoid rumination, and experience favorable health and well-being outcomes. Feeling physically energized and prosocial (i.e., physical and prosocial energy) can also enhance health and well-being (e.g., Hui et al., 2020; Ryan & Frederick, 1997). The recovery experiences and replenished energies afforded by nonwork nature exposure should in turn result in better employee health and well-being outcomes.

Proposition 4: Nonwork nature exposure will be associated with greater health and well-being outcomes, via recovery experiences and potential energies.

Job Performance Individual job performance is predicated on a combination of knowledge and motivational factors and can reflect core task performance (i.e., "in-role" behaviors) and contextual performance (i.e., "extra-role" behaviors) (Borman & Motowidlo, 1997; Wildman et al., 2011). Nature exposure improves cognitive task performance (e.g., Berman et al., 2019; Bratman et al., 2015; McDonnell & Strayer, 2024), and these effects can translate to the work domain (see Table 1). The ability to focus and control attention (i.e., cognitive energy) and having more physical energy should allow employees to concentrate on their work, exert effort, and exhibit better task performance. Effectively regulating moods (i.e., emotional energy) and being able to support others (i.e., prosocial energy) are critical for jobs that require social skills or emotional labor (e.g., caring for patients, serving customers), and can enhance contextual performance across occupations. Moreover, job engagement can be conceptualized as a motivational state in which someone has available cognitive, emotional, and physical energy to exert towards their work and is essential to job performance (Kahn, 1990; Rich et al., 2010), suggesting that the energetic resources derived by nonwork nature exposure via recovery may also result in more engaged workers.

Proposition 5: Nonwork nature exposure will be associated with greater job performance outcomes, via recovery experiences and potential energies.

Job Attitudes Attitudes reflect an individual's opinion or evaluation of favorability towards a target, such as one's job, and include cognitive (i.e., thoughts and judgments), affective (i.e., feelings), and behavioral components (Schleicher et al., 2011), mapping onto cognitive, emotional, and physical energies. In a similar vein, organizational commitment is a job attitude characterized by the psychological attachment an individual feels towards the organization they work for, and is comprised of affective, continuance, and normative factors (Meyer et al., 1993). Affective commitment describes an emotional connectedness to the organization and may be influenced by emotional energy; continuance commitment reflects a cognitive evaluation of the potential costs of leaving the organization and may rely on cognitive energy; normative commitment occurs when an individual senses a moral obligation to remain at their organization (i.e., belief that it is the right thing to do) and may be influenced by prosocial energy (Meyer et al., 1993). Past research investigating nature at work has found associations with job attitudes (see Table 1), and we posit that nonwork nature exposure can impact job attitudes through the application of restored energies that are generated from recovery experiences.

Proposition 6: Nonwork nature exposure will be associated with greater job attitude outcomes, via recovery experiences and potential energies.

Interpersonal Interactions at Work The reasonable person model was developed to identify how supportive environments, including natural settings, foster cooperation, helpfulness, and "bring out the best in people" (Kaplan & Basu, 2015), similar to the idea that nature can foster prosocial energy (Klotz & Bolino, 2021). Empathy is an important precursor to prosociality, and is a multidimensional construct comprised of the ability to feel the emotions of others (i.e., affective empathy), understand the emotions of others (i.e., cognitive empathy) and convey shared feelings or understanding to others (i.e., behavioral empathy) (Clark et al., 2019); empathy, and related interpersonal interactions, therefore also rely on available emotional, cognitive, and physical energies.

Proposition 7: Nonwork nature exposure will be associated with greater interpersonal interactions at work, via recovery experiences and potential energies.

Boundary Conditions

Key resources – individual characteristics that facilitate the mobilization or effectiveness of other resources (ten Brummelhuis & Bakker, 2012) – are boundary conditions of the NEO model. Perceptions of restorativeness are proposed as key

resources that will moderate the first paths in the NEO model (i.e., the effects of nonwork nature exposure on recovery experiences).

Perceived Restorativeness

The strength of the associations between nonwork nature exposure and recovery experiences are expected to vary depending on perceived restorativeness as outlined in ART (i.e., being away, soft fascination, compatibility, extent; Kaplan, 1995). The effects of nonwork nature exposure should be strengthened when nonwork nature exposure is perceived as affording a greater sense of *being away* from the stress of one's life, conjuring reflectiveness through *soft fascination,* being *compatible* with one's preferences, and having a rich scope that allows for immersion in the setting and a sense of connectedness to the world (i.e., *extent*) (Hartig et al., 1997; Kaplan, 1995; Kaplan & Kaplan, 1989). Specifically, each of the four components of perceived restorativeness are theorized to strengthen the relationships between nonwork nature exposure and psychological detachment and relaxation, with some components strengthening the effects on control and mastery. See Fig. 2.

Being Away Nonwork nature exposure can produce the experience of *being away*, which describes the feeling of "escape" from one's typical setting, stress, and usual demands (Kaplan, 1995). When an environment elicits greater feelings of being psychologically distanced from demands, the effect of nonwork nature exposure on psychological detachment (i.e., forgetting about work, refraining from thinking about work) should be strengthened. An environment that is viewed as an "escape" from routine obligations and stressors should also strengthen the effect of nonwork nature on relaxation. Given that some stressors are outside of an individual's control, having greater psychological separation from them in a natural environment should also create a stronger sense of control over one's life.

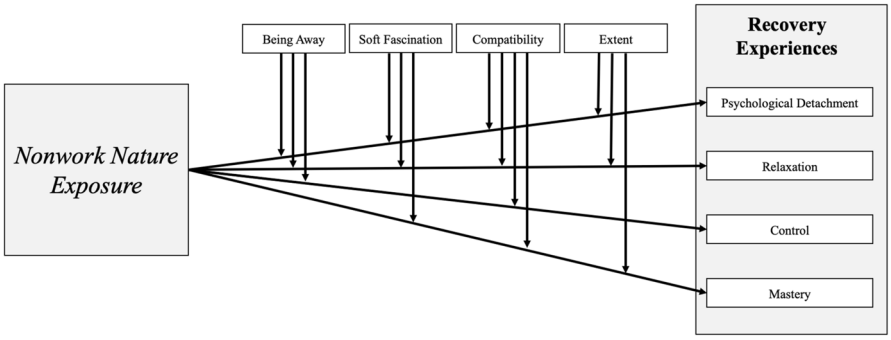

Fig. 2 Perceptions of Restorativeness as Moderators Between Nonwork Nature Exposure and Recovery Experiences

Proposition 8: The effects of nonwork nature exposure on psychological detachment, relaxation, and control will be strengthened by perceptions of being away.

Soft Fascination Nature can enable *soft fascination,* which occurs when attention is effortlessly captivated, enabling reflection (Kaplan, 1995). For example, watching the movement of leaves in a breeze is considered qualitatively different and more calming than the experience of *hard fascination*, which occurs from more stimulating activities like watching a sporting event. Soft fascination and relaxation are conceptually similar as both reflect a low-activation, calm state of mind. As such, when nonwork nature is perceived as eliciting more soft fascination, its effects on relaxation should be strengthened. The peaceful and reflective state that is achieved from soft fascination should move an individual's thoughts and attention effortlessly towards the fascinating natural features (Kaplan, 1995), which may enhance someone's ability to forget about work (i.e., psychological detachment). The fascinating elements of nature may also strengthen a sense of mastery, by providing new and captivating information about the natural world, or by replenishing the directed attention (Kaplan, 1995; Kaplan & Berman, 2010) needed for challenging mastery activities.

Proposition 9: The effects of nonwork nature exposure on relaxation, psychological detachment, and mastery will be strengthened by perceptions of soft fascination.

Compatibility Perceived compatibility, or fit between an environment and one's inclinations and preferences, should strengthen the effect nonwork nature has on feeling in control over how one's leisure time is spent. The extent to which someone would be able to achieve relaxation from nonwork nature exposure should also depend on whether it is compatible with their preferences. If an individual perceives their environment as incompatible with their desires, they may revert to thinking about work (i.e., psychological detachment) because they are not otherwise aligned with or comfortable in their surroundings. Additionally, environments that are compatible with how someone wants to spend their time will make it easier for them to carry out their intended activities (Kaplan, 1995), such as those that enable mastery. There is evidence that the beneficial effects of nature exposure are more pronounced in employees with greater nature-related personality traits and beliefs (e.g., connectedness to nature, "speciesist" beliefs, openness to experience; Klotz et al., 2023; Tang et al., 2023a, Tang et al., 2023b). Thus, the degree to which nonwork nature exposure will lead to someone feeling in control of their decisions, relaxed, free from work-related thoughts, and with opportunities to learn and grow will be stronger for individuals who have greater feelings of compatibility, and are likely those who appreciate, are open to, and feel more connected to the natural world.

Proposition 10: The effects of nonwork nature exposure on control, relaxation, psychological detachment, and mastery will be strengthened by perceptions of compatibility.

Extent Nature exposure varies in its *extent*, which is an environment's ability to engage the mind, and elicit feelings of connectedness to the larger world. Being challenged when learning something new (i.e., mastery) can facilitate the experience of flow (Csikszentmihalyi et al., 2014), which should be enhanced when the mind is especially captivated (i.e., greater extent). Feeling a greater sense of connectedness to the larger world may inspire feelings of peace and strengthen the effects of nonwork nature on relaxation, as well. Last, the sense of immersion that extent provides can enhance psychological detachment because an individual would be engaged in their environment rather than work-related thoughts or demands.

Proposition 11: The effects of nonwork nature exposure on mastery, relaxation, and psychological detachment will be strengthened by perceptions of extent.

Theoretical Implications of the NEO Model

The primary theoretical contributions of the NEO model include the emphasis on nature in the nonwork domain, the consideration of recovery experiences as mechanisms, and the inclusion of specific employee outcomes. Environmental and organizational psychology theories and research are integrated to describe how nature in the nonwork domain (i.e., a contextual resource) should enable employees to have recovery experiences (psychological detachment, relaxation, control, mastery), thereby reenergizing them with potential energies (cognitive, emotional, physical, and prosocial energy) (i.e., personal resources), that can foster greater health and well-being and be applied to the work domain to enhance job performance, job attitudes, and interpersonal interactions. The restorative benefits afforded by *nonwork* nature exposure should improve employee outcomes beyond nature exposure at work, given the greater availability and flexibility of nonwork time that lends itself to the attainment of richer recovery experiences and subsequent energy restoration. The strength of these relationships is expected to vary according to perceived restorativeness (i.e., key resources).

Moreover, despite the popularity and widespread use of ART, it has been criticized for having conceptual and empirical limitations, such as vague theoretical tenets and evolutionary underpinnings, which present challenges for testing the theory, in addition to insufficient evidence for its central assumption that nature effects are recovery effects (Joye & Dewitte, 2018). Instead, the NEO model is a testable framework that is grounded in the recovery from work stress literature, which is robust in terms of its clear operational definitions and measurement tools, as well as empirical support (e.g., Sonnentag & Fritz, 2015; Steed et al., 2021), and therefore provides a new way to examine the potential recovery effects of nature. The NEO model is also specific to the experiences and outcomes of employed individuals, which revives

earlier ideas (Kaplan, 1993) and builds on recent models (Klotz & Bolino, 2021) of work-related nature effects. Our intention is that the NEO model will help to continue "overturning the theoretical status quo" that Joye and Dewitte called for (2018, pg. 2).

Recommendations for Testing the NEO Model, Limitations, and Additional Future Research Directions

Within-Person and Between-Person Perspectives and Temporality

We recommend researchers test the NEO model from both within- and between-person perspectives and evaluate how the proposed relationships unfold over time. Within-person processes measured through daily diary designs, for example, can determine the more immediate impact of nonwork nature exposure on employee recovery experiences, energies, and outcomes that unfold on a day-to-day or individual basis. In contrast, longitudinal studies utilizing a between-person design can be useful for understanding the long-term impact of consistent or average levels of nonwork nature exposure across employed individuals.

Conceptualization, Measurement, and Dosage of Nature

One of the primary challenges facing researchers who study nature is adequately defining and measuring varied types of nature (e.g., Bratman et al., 2015; Holland et al., 2021). We echo prior calls for studies to assess more nuanced aspects of nature, such as the influence of water and relative impact of blue versus green settings (e.g., Gascon et al., 2017), urban greenspaces (e.g., community gardens), topographic variation (e.g., mountains and hills), biodiversity of plants and animals, and accessibility and use of natural areas (e.g., Holland et al., 2021; Keniger et al., 2013). Adding to this complexity, varied measurement approaches have been used. Publicly available databases provide useful metrics; for example, the National Land Cover Database includes information related to tree canopy coverage and land cover categories (e.g., grassland, deciduous forest, water) in the U.S., and the U.K. government collects data on how people in England interact with the outdoors (i.e., *The Monitor of Engagement with the Natural Environment Survey*, e.g., White et al., 2019). Self-reported measures can also be used to quantify the amount or frequency of time spent outside, activities engaged in while outside, and degree of nature contact in the workplace (e.g., Brossoit et al., 2024; Hyvönen et al., 2018; Largo-Wight et al., 2011; Lottrup et al., 2012; Wood et al., 2019). We encourage scholars interested in this work to select measures that align with their specific research questions and to work towards building a consensus for how to measure nature (e.g., Holland et al., 2021). Advancements in the conceptualization and measurement of features of ART (e.g., soft fascination, extent) are also warranted (Joye & Dewitte, 2018).

Relatedly, a remaining question and limitation of the NEO model is related to the dosage, or "how much" nature is enough to result in beneficial outcomes. Although greater exposure to nature is considered to be better, with more direct

and longer exposures expected to produce stronger effects than indirect exposure or shorter periods (i.e., smaller "doses") (Kaplan & Kaplan, 1989; Klotz & Bolino, 2021; White et al., 2019), all forms of nature exposure likely offer some benefits. Stevenson's (2018) meta-analysis found that direct (i.e., "real") exposure to natural environments (compared to virtual exposures) resulted in stronger cognitive restoration, though noted that direct exposures were typically longer in length. The relative influence of duration of time and directness of nature exposure still needs to be disentangled, as well as the optimal "dosage" of nonwork nature exposure needed to achieve recovery experiences, energy replenishment, and subsequent benefits. Ultimately, the richness and complexity of nature makes studying its effects an exciting challenge for researchers, and one that organizational scholars with psychometric and quantitative expertise are equipped to contribute to.

The Influence of Macro Resources

In addition to key resources, macro resources are also expected to play a role in the nonwork nature to employee outcomes process. Macro resources reflect the broader economic, social, and cultural environments in which employees are embedded in at work and home, and reflect more nascent, exploratory variables in the NEO model (see Fig. 1), likely influencing both the degree to which employees have nonwork nature exposure (i.e., operating as predictors), and the extent to which they may benefit from it (i.e., operating as moderators). We propose several macro resources available in the work domain (i.e., nature exposure at work, workplace benefits and support) and in the broader environment (i.e., physical safety, accessibility of nature, culture) and encourage future research in these relatively unexplored areas.

Work-Specific Resources: Nature Exposure at Work and Workplace Benefits and Support

Nature exposure may impact employees across domains in a reciprocal manner (i.e., nature exposure at work can influence nature exposure at home, and vice-versa). According to the compensatory perspective, individuals may seek something in one domain (e.g., home) when it is missing from another (e.g., work) (Drach-Zahavy & Somech, 2008; Friedman & Greenhaus, 2000). Therefore, employees who have little or no exposure to nature at work may be more inclined to spend time outdoors or bring nature into their home to compensate for the dearth of nature in their work setting. On the other hand, there may also be complementary effects of nature across domains in which individuals who reap the benefits of spending work breaks outside, or having plants and landscape art in their workspaces, may be more inclined to bring nature into their home (and vice versa). It would be worthwhile for researchers to explore the relationships between nature exposure at work on an individual's decision to seek nonwork nature exposure, and vice versa, to clarify these linkages.

Additionally, the extent to which employees can spend time outdoors and interact with nature during their nonwork time depends in part on the policies and benefits offered by their workplace. For example, nature-specific policies (e.g., Patagonia's

Let My People go Surfing philosophy) and benefits (e.g., Burton's free ski pass, REI's *Yay Days*), as well as broader approaches like flexible work arrangements may enable employees to spend more of their nonwork time outdoors. Perceived lack of time is the most common reason for not spending time in nature (Hitchings, 2013; Kellert et al., 2017), so flexible work arrangements can increase the availability of time that can be spent outside, while also fostering autonomy and the recovery experience of control. Regarding support, when employees are encouraged by their colleagues and managers to go outside, they are more likely to spend time outside at work (Lottrup et al., 2012), which may also influence how they choose to spend their nonwork time. Moreover, in line with domain-specific models of leadership (i.e., leader behaviors that target specific outcomes), such as family-supportive supervisor behaviors (Hammer et al., 2009) or sleep leadership (Gunia et al., 2015), it may also be advantageous for leaders and supervisors to encourage employees to spend time outside or increase their exposure to nature. This area is ripe for future research endeavors.

Broader Macro Resources: Physical Safety, Accessibility of Nature, and Culture

Beyond macro resources in the work domain, there are even broader environmental conditions and factors that should be considered when examining nonwork nature exposure. For instance, nature can be hazardous – natural disasters, venomous or disease-carrying insects or animals, poor outdoor air quality, extreme temperatures, sun exposure, and local crime rates can deter individuals from spending time outside (e.g., Kellert et al., 2017), jeopardize their safety and health, or impact their behavior at work (e.g., Khan et al., 2024). Considering the potential joint effects of work and nonwork nature exposure, it is also important to consider the experiences of outdoor workers (e.g., in agricultural or construction industries) or vulnerable workers (e.g., migrant farmworkers), who may encounter dangerous situations due to the demands of their job (e.g., NIOSH, 2015) and/or who have less legal protections (Neef, 2020). While a large body of literature has examined health-related hazards of outdoor work (e.g., heat; Moda et al., 2019), safety-related features of the environment have been largely ignored in organizational research that has examined the *benefits* of nature and deserves more attention in future research.

In addition to safety, individuals who live in areas with less accessible nature will also have reduced opportunities to benefit from it. There are noteworthy disparities in access to nature across the U.S., which vary systematically according to race and socioeconomic status factors (i.e., the "nature gap"; Kephart, 2022; Klompmaker et al., 2023; Rigolon et al., 2021). For instance, the quality and quantity of nature, parks, private greenery (e.g., backyards), and blue space (e.g., lakes, ponds, rivers) are more prevalent in areas with higher socioeconomic status in the U.S. (Klompmaker et al., 2023). Employees' residential neighborhood could be examined alongside historical redlining practices (i.e., those that systematically discriminated against people of color and their families in favor of native-born white families in homeownership rights and resources; Rothstein, 2017) to explore how the potential benefits of nature exposure for working adults may be influenced by historic and modern housing discrimination (Breen, 2019; Mapping Inequality, n.d.). Relatedly,

urbanity has been critiqued as limiting opportunities for exposure to nature (e.g., Hartig et al., 2014). Researchers who developed a smartphone app called "Mappiness", which assessed approximately 20,000 U.K. users' geolocation and administered brief questionnaires at random intervals to assess well-being, found that even after controlling for factors like weather, companionship, and time of day, people reported being happier outdoors in green environments compared to urban environments (MacKerron & Mourato, 2013). Limited access to nonwork nature can preclude individuals from attaining the recovery experiences needed to renew their potential energies, preventing potential benefits from coming to fruition. We encourage researchers to examine the social and environmental justice implications related to accessibility of nature.

At an even broader ecological level, cultural influences may affect the relationships presented in the NEO model. Reverence and respect for nature are central to some cultural and spiritual groups (e.g., Indigenous Peoples). Theories of national cultural values highlight differences in the degree to which people appreciate, respect, and seek unity with the natural environment, a cultural dimension known as harmony (Schwartz, 1999). Broadly, Americans tend to place little emphasis on the value of harmony, whereas it is a dominant cultural value in countries like Japan and Sweden (Schwartz, 2008). This is evidenced in cultural practices, such as the Japanese tradition of Shinrin-yoku (i.e., "forest bathing"; being immersed in a natural environment while mindfully engaging each of the five senses; Hansen et al., 2017). In the Scandinavian culture, there is a philosophy called friluftsliv (i.e., "open-air living"), in which time spend outdoors in nature is embraced (Smith, 2020). Individuals who are situated in cultures that place greater value on nature may benefit the most from nature exposure. Yet, research exploring the effects of nature has been conducted predominantly in Europe and the U.S. (Keniger et al., 2013), limiting current knowledge of possible cross-cultural factors, and offering additional avenues for future work.

Practical Implications of the NEO Model

Focusing on nature exposure in the nonwork domain removes the potential costs associated with workplace re-design efforts and shifts the focus more towards appreciating, valuing, and respecting employees' personal time. The NEO model can serve as a guiding framework for interventionists interested in developing and implementing theoretically driven and evidence-based nature interventions. Interestingly, a recent meta-analysis on work-nonwork interventions found that the most effective interventions were those that targeted personal and nonwork resources (von Allmen et al., 2023), lending some evidence that organizational nature interventions that focus on opportunities for nature exposure in the *nonwork* domain may be particularly worthwhile. Other reviews have demonstrated favorable effects of organizational nature-based interventions, but the effects tend to be small in magnitude, are typically immediate, and remain equivocal for some employee outcomes (Gilbert et al., 2018; Gritzka et al., 2020), possibly due to the heterogeneous conceptualizations and measurement of nature used (Gritzka et al., 2020), or because the nonwork

domain has not been emphasized. The empirical evidence for workplace nature interventions is still quite limited and has yet to be fully integrated with the nonwork domain, presenting exciting opportunities for future research.

Conclusion

During a time characterized by extreme levels of stress and related mental and physical health concerns (Bethune, 2022), occupational health scholars have an opportunity to examine the potential healing and restorative role of nature, and its impact on employee outcomes. The notion that "nature is good for you" has persisted throughout human history, yet we are now beginning to understand that nature may also be "good for employees". This concept is relatively new to the organizational sciences, with theoretical advancements and empirical investigations recently emerging in our field. The NEO model identifies how nature specifically in the nonwork domain can influence employees' health and well-being, job performance, job attitudes, and interpersonal interactions, through serial mediators of recovery experiences and potential energies. Ideas for how researchers can test the NEO model, and related considerations for conceptualizing and measuring nature, are offered. The NEO model provides a framework from which researchers can answer questions that have implications for employees, organizations, and the natural world they are situated in.

Author Contributions **Rebecca M. Brossoit:** Conceptualization, Project Administration, Writing – Original Draft, Writing – Review & Editing. **Jordyn J. Leslie:** Writing – Original Draft, Writing – Review & Editing.

Funding Portions of Jordyn J. Leslie's work on this paper were supported by the Grant #T03OH008435 awarded to Portland State University, funded by the Centers for Disease Control and Prevention (CDC), National Institute for Occupational Safety and Health (NIOSH). Its contents are solely the responsibility of the authors and do not necessarily represent the official views of NIOSH, CDC, or HHS.

Declarations

Competing Interests The authors have no relevant financial or non-financial interests to disclose.

Conflict of Interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

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