Getting Outdoors after the Workday:
The Affective and Cognitive Effects of Evening Nature Contact

Anthony C. Klotz
University College London
a.klotz@ucl.ac.uk

Shawn T. McClean
University of Oklahoma
smcclean@ou.edu

Junhyok Yim
City University of Hong Kong
j.yim@cityu.edu.hk

Joel Koopman
Texas A&M University
jkoopman@mays.tamu.edu

Pok Man Tang
University of Georgia
pokmantang620@gmail.com

Corresponding author: Anthony C. Klotz, UCL School of Management, Level 38 One Canada Square, Canary Wharf, London, E14 5AA

Email: a.klotz@ucl.ac.uk

ABSTRACT

A growing body of research indicates that contact with nature at work has beneficial effects on employee well-being. However, employees often spend most of their workdays indoors, largely separate from natural elements. For these employees, the bulk of their contact with nature occurs outside of work, after the workday. The extent to which this contact with nature during nonwork time helps employees recover from the workday and affects them at work the next day, if at all, is not clear, leaving an incomplete picture of the potential for employees to access the work-related benefits of nature in their personal time. In this paper, we draw from Stress Recovery Theory and Attention Restoration Theory to examine the effects of evening nature contact on work effort the following day via two paths: increased positive affect and reduced depletion. Our results, based on three studies employing different methodologies (i.e., an experience sampling study, an experiment, and a recall study), indicate that evening nature contact positively relates to beginning of workday positive affect and subsequent work effort. However, this effect only emerged for employees with high levels of nature connectedness—an individual difference reflecting individuals' innate connection to the natural world. Concerning the depletion-based link between evening nature contact and employee effort at work the next day, our results offered only limited support for this path. These findings extend our understanding of the effects of contact with nature on employees, particularly across work and home boundaries.

Keywords: Contact with nature, positive affect, depletion, work effort

GETTING OUTDOORS AFTER THE WORKDAY:
THE AFFECTIVE AND COGNITIVE EFFECTS OF EVENING NATURE CONTACT

Beginning with the agricultural revolution, and quickening with the industrial revolution, people's lives are increasingly spent indoors (Klepeis et al., 2001). Yet, this was not always the case. As Wilson (1984) details in his "biophilia hypothesis," *homo sapiens* evolved outdoors in regular, close contact with nature. For this reason, he argues that modern humans have an innate desire to maintain contact with the natural world. To this end, scholars in fields such as public health, environmental psychology, and architecture have documented myriad benefits of nature for people's well-being (Russell et al., 2013). This has attracted the attention of organizational scholars who have found that natural elements such as plants and windows in the workplace (e.g., Larsen, Adams, Deal, Kweon, & Tyler, 1998; Zadeh, Shepley, Williams, & Chung, 2014), as well as outdoor breaks during the workday (Sianoja, Syrek, de Bloom, Korpela, & Kinnunen, 2018), relate to more positive psychological states. Buoyed by such findings, organizations are increasingly designing physical spaces to incorporate natural elements (Seppala & Berlin, 2017).

Yet despite these efforts to incorporate natural elements into the workplace, the literature on how nature influences employee outcomes contains a blind spot regarding how scholars view employee day-to-day contact with nature. That is, the current research paradigm is predominantly design-focused, in that natural elements are either incorporated as a contextual element of the workspace (e.g., windows, plants, outdoor break areas), or embedded within employees' assigned tasks (e.g., handling natural materials, working outdoors) (Klotz & Bolino, 2021). In either case, the current thinking seems to be that for employees to benefit from contact with nature at work, such contact should occur *at work* (e.g., Thompson & Bruk-Lee, 2019).

This would be unfortunate if true, as it would constrain the potential impact of this stream

of research to only the subset of employees whose jobs bring them into regular contact with nature via their work environment or job tasks. Yet thinking beyond the current research paradigm, Wilson's (1984) thesis suggests that many employees can potentially access the benefits of contact with nature by spending time outdoors in nature *outside of work*. To this point, scholars widely acknowledge that activities and experiences that occur outside of work can have cross-domain implications (e.g., Lanaj, Johnson, & Barnes, 2014; Leavitt, Barnes, Watkins, & Wagner, 2019; Sonnentag, Binnewies, & Mojza, 2008). Thus, our goal is to expand the conversation in this emerging stream of research beyond a focus on what organizations can do regarding contact with nature to how employees' contact with nature on their own time can impact work outcomes.

To build our theoretical model, we draw from the two central evolution-based discourses on the positive effects of nature on humans: Ulrich's (1983) Stress Recovery Theory (SRT) and Kaplan's (1995) Attention Restoration Theory (ART). These theories provide useful frameworks for our research not only because of their explicit focus on how humans respond to their natural environment, but also given their explicit identification of two mechanisms—positive affect (PA) from SRT, and cognitive resources from ART—that can transmit the beneficial effects of contact with nature. However, for many employees, contact with nature outside of work mainly occurs in the evening *after work*, raising the question of whether the psychological effects of evening nature contact are strong and meaningful enough to still be felt at work the next day. In a potential response to this question, the aforementioned theories converge in suggesting that the experience of contact with nature may be intensified for individuals for whom such contact is intrinsically pleasurable and rewarding (although they stop short of identifying a specific trait). Thus, we extend both SRT and ART by building new theory on a specific boundary condition

that explains for whom the effects we propose—a link between evening nature contact and both PA and cognitive resources the next day—are more likely to manifest. To wit, we examine a trait that helps us understand the impact of contact with nature: nature connectedness, defined as the strength of one's relationship with the natural world (Mayer & Frantz, 2004).

To summarize our model, as shown in Figure 1, we expect evening nature contact to elicit higher PA and lower cognitive depletion the following morning for employees with higher levels of nature connectedness. We also propose that these PA- and depletion-based effects of evening nature contact will go on to impact work effort—a construct we focus on primarily due to prior conceptualizations of contact with nature as a recovery activity (i.e., "the process of psychophysiological unwinding that counteracts the strain process triggered by job demands and other stressors," Sonnentag, Venz, & Casper, 2017: 365). We first test our model with an experience sampling study, given that evening contact with nature occurs daily (Ulrich, 1983). Then, to provide more robust evidence of the internal and external validity of our model, we test it in an experiment and a retrospective study using samples of working adults.

Insert Figure 1 about here

Our research contributes to the emerging literature on employees' biophilic experiences in several important ways. First, whereas recent theoretical advancements in this area limit the scope of employees' contact with nature to that which occurs as part of their jobs (Klotz & Bolino, 2021), we draw from SRT and ART to broaden this scope and explain why employees' contact with nature after work, during their personal time in the evening, has implications for how they feel and the effort they put towards work the next day. In doing so, our paper highlights

how our understanding of the relationship between the natural world, employee affective and cognitive states, and work-related outcomes can be made more complete by extending agency to employees to obtain that contact with nature on their own time.

Second, by testing a dispositional boundary condition (i.e., nature connectedness) of the effects of evening nature contact on employees' next-day PA, depletion, and work effort, we provide insight into the extent to which individual differences both shape and extend the link between nature-related recovery activities and subsequent work behavior (Sonnentag et al., 2017). As such, this contribution responds to Gilbert, Foulk, and Bono (2018: 220), who noted we "know little about how long resource gains from nature exposure last, because most studies report immediate effects." We show that far from being fleeting (e.g., Ulrich, 1983) these effects may be durable, at least for some employees (i.e., those higher on nature connectedness).

Third, our paper tests the effects of evening nature contact on next day work effort via mechanisms that represent the two core theoretical perspectives that explain how contact with nature impacts humans. More specifically, we draw from SRT and ART to test the mediating roles of PA and depletion in the relationship between contact with nature and employee outcomes. Doing so represents a direct test of the relative usefulness of these two theories for examining the effects of contact with nature in the work domain. Fourth and finally, many prior studies of the effects of contact with nature on individuals examines how such contact affects individuals' psychological states (Klotz & Bolino, 2021). Our paper extends the literature and answers the "so what" question when it comes to the effects of contact with nature in the organizational domain by developing and testing theory related to how evening nature contact affects how employees perform at work. As such, this paper indicates that for some employees, contact with nature has more profound effects than currently realized.

THE BIOPHILIA HYPOTHESIS AND EVENING NATURE CONTACT

Wilson (1984) observed that the human brain developed over a two million-year period, during which time humans lived in hunter-gatherer bands and were completely reliant on their natural surroundings for survival. In this period, the interaction between humans' five senses and the outdoors was of extreme importance. Indeed, the smell of rainwater, the sight of lightning, or the sound of a rustling bush could have life or death implications (Wilson, 1984). As Wilson argues, the imprint of these millions of years of attention to the natural world remains today and manifests itself as "an urge to affiliate with other forms of life" (1984: 86). Thus, the biophilia hypothesis posits that having our senses engaged in the outside world has meaningful implications for our well-being and productivity (Kellert, Heerwagen, & Mador, 2008).

Wilson (1984) was not the first to propose that a deeper connection to the natural world is beneficial to humans; in prior centuries, philosophers from John Ruskin to Henry David Thoreau to Lao Tzu advocated for the restorative effects of contact with nature (The School of Life, 2016). Yet it was not until Wilson formalized this observation as the biophilia hypothesis that researchers undertook serious efforts to test its assertions. In the ensuing decades, scholars have amassed findings supporting the tenet that contact with nature is important to well-being (Hartig, Mitchell, Vries, & Frumkin, 2014; Twohig-Bennett & Jones, 2018). Buoyed by findings that contact with nature can enhance focus (Nieuwenhuis, Knight, Postmes, & Haslam, 2014), mood (Zadeh et al., 2014), and well-being (Korpela, De Bloom, Sianoja, Pasanen, & Kinnunen, 2017), researchers and popular media alike have begun to advocate for bringing people and nature into closer contact (Kohll, 2018; Stringer, 2018). This movement has gained so much traction that organizations are designing physical workspaces to bring nature into the workplace (Klotz, 2020).

Crucial to these examinations of the biophilia hypothesis were theoretical advancements

that shed light on the mechanisms via which contact with the outdoors improves well-being—the two most important of which are Ulrich's (1983) and Kaplan's (1995) theories on the restorative potential of nature (Joye & Dewitte, 2018). Regarding SRT (Ulrich, 1983), this theory proposes that nature facilitates recovery processes by generating PA, which represents a signal of security, safety, and contentment for individuals (Fredrickson, 1998). Thus, early humans who felt PA when exposed to vegetation and other natural elements were more drawn to nature, felt more restored, and thrived in its presence. Over time, our hunter-gatherer ancestors increasingly saw natural elements such as a lush landscape, the smell of rain, or the sounds of birds as signals that the environment was, at least momentarily, safe and secure (e.g., food and water were plentiful; Ulrich, 1983), thereby strengthening the link between being in nature and PA. While modern humans generally do not depend on interactions with nature for their day-to-day survival, Ulrich argues that these fundamental biological connections remain. To this end, one of the most robust findings in research on how nature impacts individuals is that it contributes to PA (Bratman, Hamilton, Hahn, Daily, & Gross, 2015; Mayer, Frantz, Bruehlman-Senecal, & Dolliver, 2009).

Moving beyond affect, ART (Kaplan, 1995) describes the cognitive effects of contact with nature on individuals. Beginning with the observation that activities which require directed attention are depleting (Kotabe & Hofmann, 2015), this theory states that contact with nature is restorative because it captures people's fascination in a "soft" way that does not require any directed attention (Berman, Jonides, & Kaplan, 2008). Because hunter-gatherers often had to expend cognitive resources in order to maintain vigilance against threats, those who found the surrounding nature passively restorative were thus better equipped to survive and pass along their genes (Kaplan, 1995; Kaplan & Berman, 2010). Importantly, stemming from the predictions made by ART, a growing body of research shows that contact with nature relates to

improved cognitive functioning (for a review, see Schertz & Berman, 2019), including in the work domain (Nieuwenhuis et al., 2014; Raanaas, Evensen, Rich, Sjøstrøm, & Patil, 2011).

Respectively, SRT and ART suggest that contact with nature is restorative for individuals because it enhances PA (SRT) and reduces cognitive depletion (ART). However, in applying the tenets of these theories to the workplace, scholars have tended to look to the organization, but not the individual. That is, instead of thinking about how employees may benefit from being *in nature*, the focus has been on bringing nature *to the employee* (Klotz & Bolino, 2021). Put differently, this research does not permit employees the agency to seek the restorative effects of nature on their own terms. Thus, we examine whether contact with nature in a domain in which they often have more agency—their evenings after work—might have sufficiently strong effects so as to allow employees to experience nature's psychological benefits at work the next day.

Evening Nature Contact and the Moderating Effect of Nature Connectedness

Most of our knowledge of the effects of contact with nature on employees is concentrated on how employees respond to nature in work settings. Yet there is a long tradition of research showing that what happens outside of work can affect employees back at work. As it pertains to our phenomenon, a prime chance to recover from work resides on the home front in the time between workdays (ten Brummelhuis & Bakker, 2012). Importantly, evenings provide ample opportunity for contact with nature, such as during outdoor socializing (Ilies, Schwind, Wagner, Johnson, DeRue, & Ilgen, 2007), exercise (Feuerhahn, Sonnentag, & Woll, 2014), or various other activities (e.g., children's sporting events, yardwork; Sonnentag, 2001). And based on the predictions of both SRT and ART, this evening contact with nature should lead to greater momentary PA and lower cognitive depletion. But, for these states to impact work outcomes, they must persist to the following day. The question is—will they?

Our position is that the answer to this question is a qualified "yes." That is, although recovery experiences generally can impact affective and cognitive states the following day (e.g., Hur, Shin, & Moon, 2020; Ouyang, Cheng, Lam, & Parker, 2019; ten Brummelhuis and Trougakos, 2014), the effects of contact with nature may be relatively weak because such contact often occurs passively, whereas recovery experiences like exercise and socialization represent relatively active pursuits. Thus, while there may be reason to believe that PA and reduced depletion stemming from evening nature contact is strong enough to extend to the following morning, we suspect this is particularly likely to occur for only certain employees. And indeed, the broader recovery literature would agree with this point, as it is clear that "not all recovery activities and recovery experiences might be equally important for everyone" (Sonnentag et al., 2017: 373). Thus, it is important to understand *for whom* these effects are likely to be particularly pronounced and thus still present the following morning.

To meet this aim, we returned to SRT and ART. Regarding SRT, Ulrich (1983: 118) observed that "individuals may vary markedly with respect to the importance or value they place on visual encounters with natural environments," and that these differences may shape people's affective responsiveness to nature. In the case of ART, one of the central tenets is that the cognitively restorative effects of nature will be more pronounced when there is compatibility, or "a special resonance" between individuals and the natural world (Kaplan, 1995: 174). Based on these theoretical tenets, we expect that the effects of evening nature contact on employee PA and depletion will be pronounced for those who are predisposed to appreciate the natural world.

Following these theoretical signposts, we looked to a trait that reflects this predisposition to appreciate and perceive an alignment with the natural world. To this point, research has shown people differ in the extent to which they feel connected to nature (Mayer & Frantz, 2004). Labeled

nature connectedness, this individual difference represents the extent to which individuals view themselves as part of a larger natural order and internalizes their belongingness to nature (Mayer & Frantz, 2004). In other words, nature connectedness refers to one's experiential sense of oneness with the natural world, and thus people with higher levels of this trait tend to feel strong attachment to the outdoors, which should intensify the positive effects of this experience (e.g., lounging in a local park, mowing the lawn, or watching a child's sporting event) (Nisbet, Zelenski, & Murphy, 2011). That is, based on SRT and ART, simply being in the presence of the sights, smells, and sounds of nature should be particularly affectively and cognitively beneficial for these individuals (Kellert et al., 2008).

Specifically, employees who feel a greater nature connectedness ascribe greater meaning to experiences in nature (Mayer & Frantz, 2004). For these individuals, then, evening nature contact should imbue a deeper sense of happiness and vitality (Nisbet et al., 2011; Wolsko & Lindberg, 2013). Indeed, recent research provides some evidence that high nature connectedness can amplify the positive effects of individuals' contact with the natural world in this manner (Martin, White, Hunt, Richardson, Pahl, & Burt, 2020). In contrast, those lower on this trait tend to be indifferent to nature and may even resent obligations that require them to be outdoors in the evenings (Schutte, Bhullar, Stilinović, & Richardson, 2017). Based on this, we expect that evening nature contact will, for those with higher levels of nature connectedness, result in greater PA and lower levels of cognitive depletion the next day at work.

> *Hypothesis 1a: The effect of evening nature contact on next day positive affect will be moderated by nature connectedness, such that the relationship will be significant and positive for those with high nature connectedness and nonsignificant for those low in nature connectedness.*

Hypothesis 1b: The effect of evening nature contact on next day depletion will be moderated by nature connectedness, such that the relationship will be significant and negative for those with high nature connectedness and nonsignificant for those low in nature connectedness.

Indirect Effects of Evening Nature Contact on Next-Day Work Effort

The prediction that evening nature contact will, for those with higher levels of nature connectedness, generate higher PA and lower cognitive depletion the next morning is important, given that both states have implications for how employees behave at work. Such an expectation lies at the heart of the recovery literature (e.g., Sonnentag et al., 2017), which is predicated on the notion that demands during work leave employees in a suboptimal psycho-physiological state (e.g., Meijman & Mulder, 1998; Zijlstra, Cropley, & Rydstedt, 2014). These states are generally temporary, so long as employees engage in restorative activities, often in the evening, before starting work the next day (Geurts & Sonnentag, 2006; Trougakos, Beal, Green, & Weiss, 2008). Based on extant conceptualizations of contact with nature as an act of recovery (Sonnentag et al., 2017), we examine how this experience can, via its effects on PA and cognitive depletion the next day, impact work effort.

Drawing insight from Conservation of Resources (COR) theory, a key tenet of which is that PA and cognitive depletion are indicators of personal resources that employees strive to accumulate and protect (Hobfoll, 2001; Hobfoll, Halbesleben, Neveu, & Westman, 2018), we submit that after work contact with nature will put employees in a position to begin the next workday in an enhanced affective and cognitive state that will fuel subsequent effort. From a COR perspective, the personal resources that employees accumulate can be invested in their work (Halbesleben, Harvey, & Bolino, 2009; Salanova, Agut, & Peiro, 2005). This means that

employees should be able to translate elevated levels of affective and cognitive resources in the morning into higher levels of work effort throughout their day (Binnewies, Sonnentag, & Mojza, 2009; Sonnentag, 2001).

Regarding PA, higher levels of this emotional resource may provide employees with the energy they need to invest in work activities (e.g., Zohar, Tzischinski, & Epstein, 2003), as highlighted by research showing that daily PA positively impacts employees' work effort and performance in their work tasks (Sonnentag, Eck, Fritz, & Kühnel, 2020). Concerning cognitive resources, it is well established that to the extent that employees are less depleted, they are better able to invest effort in their jobs in the pursuit of higher job performance (Johnson, Lin, & Lee, 2018). And indeed, prior research on COR argues that the depletion of cognitive resources has implications for employee ability to perform their job (e.g., Hunter, Cushenbery, & Jayne, 2017).

Therefore, those employees' whose evening contact with nature increases next day PA and reduces depletion should then invest more effort into their work tasks. In conjunction with our prior hypotheses, we therefore propose that contact with nature in the evening for those with high nature connectedness will not only lead to greater PA and lower depletion than in those with low nature connectedness, but indirectly to increased work effort as well.

Hypothesis 2a: The positive indirect effect of evening nature contact on work effort via positive affect will be moderated by nature connectedness, such that the indirect effect will be significant and positive for those with high nature connectedness and nonsignificant for those low in nature connectedness.

Hypothesis 2b: The negative indirect effect of evening nature contact on work effort via depletion will be moderated by nature connectedness, such that the relationship will be significant and negative for those with high nature connectedness and nonsignificant for

those low in nature connectedness.

OVERVIEW OF STUDIES

We conducted three studies that employ different research methodologies (a within-person experience-sampling [ESM] field study, a between-person experiment, and a between-person retrospective study, involve participants across a wide array of industries and from different countries (i.e., United States [US] and United Kingdom [UK]), and include a robust set of control variables to rule out potential alternative explanations. Since employees' (after-work) contact with nature can vary across days (e.g., Klotz & Bolino, 2021; Li, Deal, Zhou, Slavenas, & Sullivan, 2018), Study 1 employs an ESM design as an initial test of our theory (i.e., measuring contact with nature in the evening and evaluating its moderated relationship with PA and depletion the following morning and work effort later that day). We then conducted two between-person studies with different designs with working adults, in order to replicate Study 1's findings, provide evidence of causal direction and control for alternative factors (either through study design or measurement) that could influence our hypothesized relationships.

In Study 2, we experimentally manipulated whether people were shown images of outdoor areas where one would commonly spend time in the evening (e.g., park with natural elements) or matched images of evening outdoor spaces that did not contain nature (e.g., urban park without natural elements) (Gilbert et al., 2018). We asked participants to imagine they had spent time in that environment the previous evening, and then to respond to questions about how they currently felt and the effort they would anticipate exerting later that day. Then, in Study 3, we asked participants to report their prior evening nature contact using an established scale, before measuring their PA and depletion, and finally assessing their work effort using an objective performance task.

STUDY 1 METHODS

Sample and Procedures

As part of a larger data collection effort, we recruited 130 employees of a large research university in the southern US—each of whom also nominated a coworker to participate, resulting in an initial sample of 256 participants. Each employee worked at least 30 hours per week and could earn up to $70 of Amazon credit based on the number of surveys completed. One week after completing an enrollment survey that gathered information about their work, participants received a one-time survey that assessed their nature connectedness. The Monday following this one-time survey, participants began receiving three surveys per workday for a period of three weeks (15 working days). These three daily surveys, personalized to each participants' work schedules, were scheduled to arrive prior to beginning their workday, during their lunch break, and at the end of their workday. The average completion time for the first daily survey was 8:43 AM, while the second and third daily surveys were completed—on average—at 12:51 PM and 5:26 PM, respectively. We retained data only from those participants who completed more than three days of surveys (Gabriel, Koopman, Rosen, & Johnson, 2018). Our final sample therefore consisted of 199 participants who provided 1,570 complete daily responses (53% response rate). Of these participants, 84% were female, with an average age of 38.89 (SD = 11.7) years.

Measures

Evening nature contact. Each morning, participants reported the amount of time they had spent outdoors the prior evening. Specifically, participants first reported the number of hours they spent outdoors "between leaving work yesterday and when [they] went to sleep last night" using a slider. This slider was anchored at zero and five hours; however, participants could separately enter any numerical value if their amount of time spent outdoors exceeded five hours.

In order to maximize variance on this variable, as well as to provide participants with greater reporting options, each slider was keyed to report to the tenths of hours.

Daily positive affect. We measured daily PA each morning using five items drawn from MacKinnon, Jorm, Christensen, Korten, Jacomb, and Rodgers (1999). Specifically, participants reported the extent to which each of these affect adjectives described how they felt "right now" (1 = "To a very small extent," 5 = "To a very large extent"). Example items include "Excited" and "Alert." The average reliability across study days was .94.

Daily depletion. We measured daily depletion each morning using five items from Johnson, Lanaj, and Barnes (2014). A sample item is "My mind feels unfocused right now" (1 = "Not at all," 5 = "A great deal"). The average reliability across study days was .94.

Daily work effort. We measured daily work effort each afternoon survey using three items drawn from De Jong and Elfring (2010). Participants responded to items such as "Since the previous survey, I have worked as hard as I can to achieve my objectives" and "Since the previous survey, I have made an effort to attain high performance levels" (1 = "Not at all," 5 = "A great deal"). The average reliability across study days was .98.

Nature connectedness. In the initial survey, we used the 14-item scale developed by Mayer and Frantz (2004) to measure nature connectedness. Example items include "I often feel a sense of oneness with the natural world around me" and "I often feel disconnected from nature (reverse coded)" (1 = "Strongly disagree," 5 = "Strongly agree"). Cronbach's alpha was .87.

Control Variables

To isolate the effects of evening contact with nature, we controlled for (a) previous day contact with nature *during work,* (b) current day contact with nature *before work,* and (c) current day contact with nature *during work*. We measured each with similar sliders to those used to

measure evening nature contact (described above). To account for findings on the effects of natural elements in the workplace, we also controlled for (d) the amount of workday time spent with a view of the outdoors, and (e) the amount of time spent in the presence of natural elements (e.g., desk plants), during the current workday; these three forms of contact with nature at work were measured in the third daily survey. Finally, because sleep has meaningful effects on start-of-day psychological states (Barnes, Guarana, Nauman, & Kong, 2016), we controlled for participants' sleep quality the prior night with four items from Scott and Judge (2006). An example items is "I woke up several times during the night" (1 = "To a very small extent," 5 = "To a very large extent"). The average reliability, across days, for this scale was .81.

Recent research on ESM practices has encouraged scholars to account for temporal factors that may indicate an underlying cyclical or temporal trend (Gabriel et al., 2019). Namely, Beal and Ghandour (2011) recommend controlling for the day of the week (i.e., Monday-Friday), as well as the sine and cosine of the day account for linear, within-week change, as well as within-week cycles of change on each endogenous variable. We thus controlled for each of these factors in all analyses. To account for potential linear trends over the course of the study, we also controlled for the day of the study. Finally, we controlled for lagged (i.e., prior day) versions of all endogenous variables to further isolate the effects of our proposed predictor variables.

Analysis

Due to the nested nature of our data (i.e., days nested within individuals), we utilized multilevel path analysis using Mplus 8 (Muthén & Muthén, 2017), allowing us to simultaneously model the within- and between-person variance of each of our study variables. However, given that participants were nested within dyads due to our snowball recruiting method, we accounted for this additional level of nesting using the complex sandwich estimator in Mplus (Yoon et al.,

2021). Hypothesized relationships were modeled at Level 1 with random slopes, while control variables were modeled with fixed slopes (Wang, Liao, Zhan, & Shi, 2011). Our moderator (i.e., nature connectedness) was modeled at Level 2. We group-mean centered Level 1 predictors and grand-mean centered our Level 2 predictor (Hofmann, Griffin, & Gavin, 2000).

To test our conditional indirect effect hypotheses, we used parametric bootstrapping to examine the effect of evening nature contact on work effort through daily PA and depletion. In line with prior research (Preacher, Zyphur, & Zhang, 2010), we used a Monte Carlo simulation with 20,000 replications to construct 95% bias-corrected confidence intervals around these indirect effects at high (+1 SD) and low (-1 SD) levels of our moderators.

STUDY 1 RESULTS

Prior to testing our hypotheses, we conducted a multilevel confirmatory factor analysis (CFA) to ensure the distinctiveness of our study variables. Given that our independent variable of evening nature contact is a count variable, we excluded it from this analysis. Thus, our hypothesized model includes three within-person variables—daily PA, depletion, and work effort—and one between-person variable—nature connectedness. Results show that this model adequately fit the data (χ^2 = 585.01, *df* = 139, RMSEA = .05, CFI = .95, $SRMR_{Within}$ = .05, $SRMR_{Between}$ = .06). Next, we examined the proportion of within-person variation of each of our focal study variables. As shown in Table 1, evening nature contact, PA, depletion, and work effort demonstrated 57%, 28%, 42%, and 48% within-person variation, respectively.

Hypothesis Testing

Table 1 shows the means, standard deviations, reliabilities, and correlations among the study variables. The results for the multilevel path analysis are shown in Table 2. Hypothesis 1a posited that evening nature contact would positively influence PA the next morning, but that this

effect would be conditional on nature connectedness. As shown in Table 2, the interaction between evening nature contact and nature connectedness was significant ($\gamma = .072$, $p = .047$). We plotted this interaction at high (+1 SD) and low (-1 SD) levels of nature connectedness. As Figure 2 shows, evening nature contact positively associated with next morning PA for those employees higher on nature connectedness (slope = .092, $p = .015$). However, this effect was not significant for employees lower on nature connectedness (slope = .000, $p = .999$). Thus, Hypothesis 1a was supported. Hypothesis 1b suggested that nature connectedness would interact with evening nature contact, such that the effect of such contact on depletion would be more negative at higher levels of nature connectedness. However, this interaction effect was not significant ($\gamma = .017$, $p = .669$); Hypothesis 1b was therefore not supported.

Insert Tables 1 and 2 and Figure 2 about here

Hypothesis 2a concerned the indirect effect of evening nature contact on next-day work effort, through morning PA, and conditional on nature connectedness; this effect was predicted to be more positive for employees higher on nature connectedness. Table 3 displays the results of our conditional indirect effect analyses. For employees higher on nature connectedness, evening nature contact positively associated with daily work effort, through PA (indirect effect = .012, 95% CI [.002, .032]). However, for employees lower on nature connectedness, the indirect effect was not significant (indirect effect = .000, 95% CI [-.011, .008]). The difference between these two indirect effects was significant (indirect effect difference = .012, 95% CI [.001, .036]), thus supporting Hypothesis 2a (Preacher, Rucker, & Hayes, 2007). Hypothesis 2b concerned the indirect effect of evening nature contact on next-day work effort, through morning depletion, and

conditional on nature connectedness; this effect was predicted to be more negative for employees higher on nature connectedness. As Table 3 shows, evening nature contact was not associated with work effort, through depletion, for employees at either higher (indirect effect = .002, 95% CI [-.006, .015]) or lower (indirect effect = .004, 95% CI [-.002, .018]) levels of nature connectedness. The difference between these two effects was not significant (indirect effect difference = -.003, 95% CI [-.020, .009]), thus failing to support Hypothesis 2b.

Insert Table 3 about here

DISCUSSION OF STUDY 1 FINDINGS

Study 1 provides initial evidence on the interactive effect of evening nature contact and employee nature connectedness on next day work effort via morning PA, but not depletion. As hypothesized, evening nature contact led to higher levels of PA the following morning for those employees higher on nature connectedness. However, the predicted effect on depletion did not emerge. Although this study follows best-practice design and methodological recommendations for conducting a within-person field study (see Gabriel et al., 2019), it is not without limitations.

Even though our measures were separated temporally, field study designs are somewhat limited in demonstrating causality. Because this study simply asked how much time participants spent outdoors after work, it could not account for why people spent time in nature. Addressing this is important because people who are less stressed (or similarly experiencing higher PA) may be more likely to both spend time in nature (Sonnentag, 2018), as well as experience higher PA and reduced depletion the next morning. Thus, it is essential to provide further evidence for our proposed causal order. Moreover, in Study 1, we could not account for the different outdoor

places in which each participant spent time in the evening, raising questions about whether it is being outdoors—in nature—that is driving our effects or the activities that occur outdoors (e.g., physical activity). Finally, Study 1 failed to account for an alternative mechanism (i.e., recovery; Sonnentag et al., 2008) that could affect our proposed relationships. To address these limitations, we experimentally manipulated evening contact with nature in Study 2.

STUDY 2 METHODS

Sample and Procedures

We recruited participants through Prolific, an online survey platform used in multiple experimental management studies (e.g., Sherf & Morrison, 2020; SimanTov-Nachlieli & Bamberger, 2021). Using Prolific's capacity to prescreen participants, we selected working adults from the UK who work full or part time and who work during regular working hours (i.e., 9 AM to 5 PM). The reason for this prescreening was to select participants who fit our research purpose of showing the effects of evening nature contact on next day outcomes at work.

We conducted a one-time survey on a regular weekday, during morning hours (6am to 11am), using prescreened participants who had worked the prior day. In the survey, we asked participants to report their nature connectedness before randomly assigning them to either an experimental condition containing images of outdoor natural areas or a control condition containing images of city that did not include nature. After imagining they spent their evening in the settings depicted in the pictures, participants responded to the survey measures.

Among the 166 participants who were initially prescreened, 155 passed an attention check question that asked them to click on a certain value. The final sample had an average age of 34.80 years (SD = 9.62), and an average organizational tenure of 6.27 years (SD = 6.56). Moreover, 49.03% of participants were female, and 88.39% White, 5.16% Asian, 3.87% Black,

0.65% Middle Eastern, and 1.94% preferred not to answer. Participants were paid 2.5 pound sterling for completing the study.

Measures

Nature connectedness. We used the same 14-item scale (Mayer & Frantz, 2004) from Study 1 to measure nature connectedness. Coefficient alpha was .86.

Nature condition manipulation. To manipulate contact with nature in the evening, we randomly assigned participants to two conditions. In the experimental (i.e., evening nature) condition, participants viewed four photographs of outdoor settings with natural elements, set in the evening; in the control condition, they viewed four photographs of similar outdoor settings, but without natural elements, set in the evening (see Appendix for all photographs). Participants were required to view each photograph for at least 15 seconds.

Positive affect and depletion. We used the same scales as in Study 1 to measure PA and depletion, "right now." Coefficients alpha were .90 and .93 for each scale, respectively.

Expected work effort. Using the same scale as in Study 1, we asked participants the extent to which they feel they can put effort into their work today. An example item was "Today at work, I will work as hard as I can to achieve my objectives." Coefficient alpha was .93.

Manipulation check. We asked participants to indicate the extent to which the photographs they saw contained natural elements. Specifically, participants answered three items from Largo-Wight, Chen, Dodd, and Weiler (2011): "Please rate your level of exposure to natural elements," "Please rate the extent to which you noticed the natural elements," and "Please rate the extent to which that you have been exposed to natural elements" (1 = "not at all," 5 = "A great deal"). Coefficient alpha was .95.

Control Variables

Detachment. Prior research suggests that recovery from work via detachment can positively affect PA (Sonnentag, Mojza, Binnewies, & Scholl, 2008). Thus, we controlled for such recovery as an alternative mechanism, using four items from Sonnentag and Fritz (2007). Sample items include "Right now, I have forgotten about work," and "Right now, I am not thinking about work" (1 = "Strongly disagree," 5 = "Strongly agree"). Coefficient alpha was .75.

Analysis

We first conducted a CFA on our study variables to confirm that the model fit our data. The five-factor model with nature connectedness, PA, depletion, detachment, and work effort fit the data adequately (χ^2 = 690.82, *df* = 424, CFI = .90, RMSEA = .06, SRMR = .08). To examine the effectiveness of our manipulation, we conducted a one-way Analysis of Variance (ANOVA); as expected, participants in the evening nature condition (*M* = 3.87, *SD* = .09) rated their nature exposure as significantly higher compared to those in the control condition (*M* = 1.78, *SD* = .10; *t*[153]= -15.60, *p* < .001). Thus, we proceeded to test our model using path analysis with Mplus 8 (Muthén & Muthén, 2017); tests for moderated mediation were conducted as in Study 1.

STUDY 2 RESULTS

Descriptive statistics and correlations among study variables are presented in Table 4. To test Hypotheses 1a and 1b, we conducted a path analysis to examine the interactive effects of the evening nature contact manipulation and nature connectedness on (a) PA and (b) depletion. As shown in Table 5, results showed that imagining evening nature contact and nature connectedness had a significant interactive effect on PA (*B* = .554, *p* = .022). This interaction is plotted at high (+1 SD) and low (-1 SD) levels of nature connectedness in Figure 3. As shown here, the effect of imagining evening nature contact on PA was significant and stronger at higher levels of nature connectedness (simple slope = .490, *p* =.018) than at lower levels (simple slope =

-.187, p = .373). Thus, Hypothesis 1a was supported. Similarly, the interactive effect of imagining evening nature contact and nature connectedness on depletion was significant (B = -.716, p = .008). As shown in Figure 4, the effect of imagining evening nature contact on depletion was significant and more negative at higher levels of nature connectedness (simple slope = -.682, p = .003) than at lower levels (simple slope = .193, p = .411), supporting Hypothesis 1b.

Insert Tables 4 and 5 and Figures 3 and 4 about here

Hypothesis 2a predicted that the indirect effect of evening nature contact on expected work effort via PA is moderated by nature connectedness. As reported in Table 6, the indirect effect between imagining evening nature contact and work effort via PA is stronger when nature connectedness was high (indirect effect = .128; 95% CI [.027, .292]) compared to when it was low (indirect effect = -.049; 95% CI [-.187, .050]). Moreover, the difference between these indirect effects was significant (difference = .177; 95% CI [.033, .415]). Thus, Hypothesis 2a was supported. Hypothesis 2b stated that nature connectedness would moderate the indirect effect of evening nature contact on expected work effort via morning depletion. The indirect effect of imagining evening nature contact on work effort via depletion was stronger at higher levels of nature connectedness (indirect effect = .147; 95% CI [.044, .322]) than at lower levels of nature connectedness (indirect effect = -.042; 95% CI [-.174, .051]). The difference between these two indirect effects was significant (difference = .189; 95% CI [.047, .429]), supporting Hypothesis 2b.

Insert Table 6 about here

DISCUSSION OF STUDY 2 FINDINGS

The findings of Study 2 replicate the findings in Study 1 related to the PA-based effects of evening nature contact and nature connectedness on work effort. They also go beyond Study 1 by finding support for our prediction that the interaction of evening nature contact and nature connectedness will affect next day work effort via depletion; thus, Study 2 provided full support for our theorized model. Importantly, Study 2 addressed some of Study 1's limitations with an experimental design, thereby providing stronger evidence for our causal arguments while holding constant the myriad reasons that individuals may have had contact with nature in the first place.

Despite the strengths of this study, it too is not without limitations. While the photograph-based manipulation provides a high level of experimental control, it is necessarily somewhat synthetic and potentially lacking in realism. An additional limitation of both Studies 1 and 2 is that while work effort is theoretically related to the focal phenomenon, our findings would have more meaningful implications if we could demonstrate the evening nature contact affects the objective result of work effort—that is, actual work performance. To address these issues, we designed Study 3 to measure evening contact with nature using a measure that captures actual contact with nature, but in a way that accounts for the potential effects of factors such as physical activity, unhealthy eating, stress, and weather as potential confounds to our hypothesized relationship. Further, we operationalized work effort in Study 3 using an objective measure.

STUDY 3 METHODS

Sample and Procedures

We again recruited participants from the UK through Prolific, using identical screening criteria as in Study 2. We conducted a one-time survey with those prescreened participants who had worked the prior day. In this survey, participants first reported their level of nature connectedness, and then reported their contact with nature the prior evening, along with other activities and aspects of their prior evening (i.e., physical activity, unhealthy eating, stress, and weather) that could affect their PA and depletion. We then asked participants to report their current (morning) PA, depletion, and detachment. Finally, participants engaged in a performance task (i.e., writing a business proposal). Among the 200 participants we recruited, 183 passed a one-item attention check identical to the one used in Study 2. The final sample had an average age of 33.80 years (SD = 9.15), and an average organizational tenure of 5.92 years (SD = 6.06). Moreover, 50.28% were female, and 87.98% White, 4.92% Asian, 2.19% Hispanic, 1.09% Black; 3.83% preferred not to answer. Participants were paid 2.5 pound sterling for the study.

Measures

Nature connectedness. We used the 14-items from Studies 1 and 2 to measure nature connectedness (Mayer & Frantz, 2004). Cronbach's alpha was .86.

Evening nature contact. Participants reported evening nature contact using eight items from Largo-Wight et al. (2011). Specifically, we measured the extent to which participants came into contact with specific natural elements between leaving work and going to bed the prior evening on a five-point Likert scale (1 = "To a very small extent," 5 = "To a very large extent"). Example of natural elements included "live plants or flower arrangements," "animals and pets," and "windows (including those on doors) that lead directly to outdoors."

Positive affect and depletion. We used the same scales and instructions for these variables as in Studies 1 and 2, measuring PA and depletion as participants felt each "right now." Coefficients alpha were .85 and .93 for PA and depletion, respectively.

Work effort. Work effort was measured using an objective performance task (see Tang et al. [2021]). In the task, participants were told to imagine they were consultants who were asked to provide business advice to a client who was experiencing difficulty due to factors such as increased competition and a recent economic downturn. Participants were told the company assigned them to offer this client some business consultancy services to help the client overcome this challenging business situation. We asked the participants to provide business-relevant recommendations that would help solve the operational difficulties faced by the client. Use of this task in prior research indicates that it elicits of range of potential recommendations from participants, such as suggested differentiation strategies, discussion of the strengths and weakness of the current business model, the development of marketing and promotion plans, and explanation of short-term plans that can help the client become more competitive (Tang et al., 2021). The mean length of participants' responses to this task was 116 words.

We used the Consensual Assessment Technique (Amabile, 1982) to evaluate quality of participants' business proposals. Four independent judges—graduate business students in a research university—were recruited via the authors' personal networks. Consistent with prior approaches (see Berg, 2019; Tang et al., 2021), the business proposals from the participants were randomly distributed among these four independent raters. We instructed the raters to rate the overall quality of the business proposals (from 1 = "*extremely low*" to 5 = "*extremely high*."). Following prior studies (e.g., Berg, 2019), the raters used several criteria to evaluate the overall quality of the business proposals: *comprehensiveness* (degree to which the business plan is

thorough in identifying the business problems and solutions), *concreteness* (degree to which the business plan provides concrete details about how to help the clients), *profitability* (degree to which the business plan would help to increase profitability), *novelty* (degree to which the ideas in the business plan are unique and novel), and *feasibility* (degree to which the business plan is practically feasible). Ratings from these raters met standard cutoffs for interrater reliability (ICC [A, 4] = .71; LeBreton & Senter, 2008); we averaged them to create the performance measure.

Control Variables

Detachment. We controlled for detachment using the same scale as Study 2 (Sonnentag & Fritz, 2007). Cronbach's alpha was .81.

Other evening factors. To isolate the effects of evening nature contact on our theorized mechanisms, we controlled for variables that could affect participants' morning PA and depletion. Unless otherwise noted, all measures utilized a 5-point Likert scale (1= "Strongly disagree", 5= "Strongly agree"). First, we controlled for physical activity in the evening using one-item from Moljord, Eriksen, Moksnes, and Espnes (2011). Participants reported the extent to which "I spent time exercising in nature" yesterday, between leaving work in the evening and going to bed that night. Second, we controlled for unhealthy eating in the evening using four items from Liu, Song, Koopmann, Wang, Chang, and Shi (2017), as unhealthy eating in the evening could affect mood in the morning (Cho & Kim, 2022). Participants reported the extent to which they "ate too much junk food," "had too many unhealthy snacks," "ate excessively," and "had late-night snacks" between leaving work in the evening and going to bed last night. Cronbach's alpha was .84. Third, because work stress can affect how individuals feel the next day (e.g., Stewart & Barling, 1996), we assessed prior day work stress using four items from Matta, Scott, Colquitt, Koopman, and Passantino (2017). Participants reported the extent to

which they felt each item between leaving work in the evening and going to bed last night. An example item is “I felt a great deal of stress because of my job”. Cronbach’s alpha was .90. Finally, we controlled for weather in the evening as it may influence individuals’ PA in the morning (Stone & Neale, 1984). We measured weather with Knez, Thorsson, Eliasson, and Lindberg’s (2009) three-item scale. An example item was “the weather was calm for outdoor activity.” Cronbach’s alpha was .88. Finally, we controlled for participants’ gender and age.

Analysis

We first conducted a CFA on the study variables (i.e., unhealthy eating, work stress, weather, PA, depletion, detachment, and nature connectedness). We did not include evening nature contact and work performance because these are not reflective constructs. The model fit the data adequately (χ^2 = 1043.75, *df* = 681, CFI = .91, RMSEA = .05, SRMR = .06). We therefore proceeded to test our hypotheses using the same path-analytic approach as Study 2.

STUDY 3 RESULTS

Descriptive statistics and correlations among all variables are presented in Table 7, and path-analytic results are presented in Table 8. Hypotheses 1a and 1b stated that the effect of evening nature contact on next day (a) PA and (b) depletion will be moderated by nature connectedness. As shown in Table 7, the interactive effect between evening nature contact and nature connectedness on PA was positive and significant (*B* = .277, *p* = .040). As Figure 5 shows, the effect of evening nature contact on PA was significant and more positive at higher levels of nature connectedness (simple slope = .410, *p* =.000) than at lower levels (simple slope = .084, *p* = .555). Thus, Hypothesis 1a was supported. In contrast however, the interactive effect of evening nature contact and nature connectedness on depletion was not significant (*B* = -.134, *p* = .469). Thus, Hypothesis 1b was not supported.

Insert Tables 7 and 8 and Figure 5 about here

Hypothesis 2a predicted that the indirect effect of evening nature contact on work effort via PA is moderated by nature connectedness. As reported in Table 6, the indirect effect between evening nature contact and work effort via morning PA was positive and significant when nature connectedness was high (indirect effect = .121; 95% CI [.053, .224]) but not when it was low (indirect effect = .025; 95% CI [-.028, .095]). Moreover, the difference between these indirect effects was significant (difference = .096; 95% CI [.037, .193]). Thus, Hypothesis 2a was supported. Hypothesis 2b stated that nature connectedness would moderate the indirect effect of evening nature contact on work effort via morning depletion. However, the indirect effect of evening nature contact on work effort via depletion was not significant at either high (indirect effect = .024; 95% CI [-.022, .082]) or low (indirect effect = -.017; 95% CI [-.072, .031]) levels of nature connectedness. The difference between these indirect effects was also not significant (difference = .040; 95% CI [-.005, .103]), failing to support Hypothesis 2b.

DISCUSSION OF STUDY 3 FINDINGS

Study 3 tested our entire theoretical model using a direct measure of evening nature contact, and controlling for a robust set of theoretically relevant confounding variables that could provide alternate explanations for the effects in our model. A strength of this study was also its use of an objective measure of performance. Similar to Study 1, the results of Study 3 provide strong support for the interactive effects of evening nature contact and nature connectedness on next day work effort, via PA, but not via depletion.

GENERAL DISCUSSION

An emerging body of evidence indicates that the beneficial effects of nature extend to employees when they come into contact with nature while at work (Korpela, De Bloom, & Kinnunen, 2015). Yet this body of literature has two important oversights. First, it fails to permit employees agency to immerse themselves in nature *outside of work* as a means of reaping any positive effects at work. Second, it neglects to consider that for many employees, most of their contact with nature occurs during in the evening during nonwork hours. It is an open question as to whether the positive states that may arise from this contact are strong enough to impact work outcomes the following day. Thus, our study addresses these two issues by examining *for whom* contact with nature in the evening, outside of work, may impact work outcomes the following day.

Results from three studies with different methodologies supported our predictions concerning PA and provided limited support for those involving depletion. Specifically, employees higher on nature connectedness realized the affective benefits of evening nature contact leading to higher subsequent work effort whereas those employees with lower levels of nature connectedness were unaffected by after-work contact with nature. These same effects were observed for the mediating effect of depletion, but only in Study 2. These findings suggest that employees who are particularly in tune with the natural world may attach greater meaning to contact with nature in the evening, such that the positive affective and cognitive effects are more enduring. In this way, employees who feel connected to nature may "hold on to" their evening outdoor experiences, such that those experiences exert a positive effect the following morning.

Of note, the main effects of contact with nature on next morning PA and depletion were also generally not significant (except for one path from evening contact with nature on next morning PA in Study 3). Main effects in the context of a moderator are interpreted as the effect

at average levels (Edwards, 2008). Thus, this further illustrates that these effects are largely only present for those with higher levels of nature connectedness, rather than for those with either lower or average levels of nature connectedness. This is important because it highlights that the positive effects of evening nature contact largely accrue to a specific subset of employees, rather than the "average" employee; this notion has important implications for both theory and practice, as we discuss in greater detail below.

Theoretical Contributions

In examining the aforementioned effects, our findings broaden our understanding of the effects of contact with nature on employees and of the implications of biophilic work design. Specifically, while our findings lend credence to Klotz and Bolino's (2021) theorizing that employee contact with nature will positively contribute to workers' levels of emotional and cognitive energy, as indicated by PA and depletion, they also diverge from it. Whereas the theory of biophilic work design emphasized the effects of contact with nature at work on employees (Klotz & Bolino, 2021), our results indicate that their focus on contact with nature that occurs within the context of the work domain only provides a partial picture of how employee exposure to nature affects them at work. This contribution is particularly important as many employees' work settings restrict the potential for meaningful contact with nature during work hours.

In addition, whereas Ulrich (1983) predicted that the PA generated by contact with nature would be relatively fleeting, our findings challenge and extend this perspective by providing evidence that when it comes to employees' nature contact after work, the PA generated by this exposure can carry over to the next morning and fuel subsequent work effort. Yet this warrants an important degree of contextualization; the effect of evening nature on PA only endured to work the next day for those employees who attach greater meaning to nature (i.e., higher on

nature connectedness). As such, our research highlights the importance of considering the activating or mitigating effects of individual differences when examining the effect of exposure to nature on employees and others.

Third, in providing robust support for the PA-based effects of contact with nature on employee effort but only limited support for the role of depletion in this relationship, our findings indicate that SRT may provide a more useful theory for understanding the effects of evening nature contact on employees than ART. ART proposes that contact with nature can be cognitively restorative because such contact is softly fascinating and does not require directed attention. While the support of our ART-based predictions in Study 2 lends some credence to this theory, the lack of support in Studies 1 and 3 suggest that more research is needed to understand the extent to which evening nature contact is restorative enough to provide cognitive resources to employees the following workday.

Finally, in this paper, we theorized that evening nature contact should not only affect how employees feel at work, but also how they behave in the work domain. In finding support for this prediction and showing that contact with nature has implications for the effort employees exert at work, we contribute back to the environmental psychology literature, which has tended to focus predominantly on the effects of contact with nature on individuals' well-being (Hartig et al., 2014; Russell et al., 2013). Thus, we expand this conversation to show that contact with nature can also have implications for individuals' productivity. Moreover, in showing how evening nature contact affects employee effort, we provide at least a partial answer to the "so what" question when it comes to biophilic work design, more broadly. Put differently, our results point to an important outcome of biophilic work design specifically, and contact with nature more generally, which points to the theoretical importance of studying this emerging workplace trend.

Practical Implications

This study also offers important implications for organizational managers. First, while we acknowledge the value offered by research on workspace design as a means of increasing employees' contact with nature in the workplace, our research pinpoints an alternative means by which employees can fulfill their innate desire for contact with nature—in the evenings outside of work. In this way, our study offers organizational leaders an additional lever by which they can utilize contact with nature to impact employee functioning at work. Specifically, organizations may find value in encouraging employees to spend some portion of their evenings with nature, and one way they may accomplish this is by offering employees flexible work arrangements. That is, allowing employees to shift their workday forward to allow more time in the evening for contact with nature may help employees recover from their workday.

The ongoing shift toward remote-work arrangements (Thompson, 2020) offers organizations another way by which they may encourage employees to spend time in contact with nature. That is, our study identifies the benefits of employees being in contact with nature outside of the workday. As employees shift to spending considerable portions of their workdays working from home, this may afford them the opportunity to more easily shift from their work duties to spending time in nature, making the implications of our study potentially relevant for outdoor breaks while working remotely. At the same time, for employees who return to traditional workplaces after the pandemic, they may feel particularly deprived of opportunities for outdoor breaks, thereby making evening nature contact even more meaningful.

Our findings also point to the central role of nature connectedness in determining which employees are likely to reap the benefits of nature contact. Specifically, our research broadly suggests that the PA-inducing and depletion-reducing effects of evening nature contact is

primarily reserved for those employees higher on nature connectedness. This serves to highlight the importance of organizations being cognizant that employees will not benefit equally from nature exposure; efforts to encourage employees to spend time around nature will only be successful to the extent that employees feel connected to nature. Before organizational leaders make large investments in increasing their employees' contact with nature, they should acknowledge that these investments may only pay off for workers who have a relatively strong connection to the natural world.

Limitations and Directions for Future Research

Despite a number of strengths, including large sample sizes, as well as a combination of ESM and experimental designs, our research is not without limitations. First, although we built theory pertaining to the beneficial effects of evening nature contact, there are other activities that could occur during evenings that may have similarly beneficial effects. While we took steps to account for these factors (e.g., our experimental design in Study 2, accounting for factors such as physical activity and weather in Study 3), there may be similar, potentially confounding, factors that we did not consider. There is an opportunity, then, for finer-grained assessments of evening nature contact, such as measures that capture different types of outdoor activities, given that different nature-based activities, such as a walk in a park, may be more or less beneficial than other similar activities, such as mowing one's lawn. We thus encourage scholars to prioritize the development of contact with nature scales which may help account for additional potential confounds by more precisely isolating the effects and form of evening time spent outdoors.

Second, while we focused on the downstream implications of evening nature contact on employees' work effort, such nature contact may affect employee outcomes beyond effort. While our choice of outcome was spurred by the biophilia hypothesis as well as SRT and ART, it may

be fruitful for future scholars to consider employee outcomes that may be less directly germane to the workplace. For instance, examining the effect of employee contact with nature on outcomes related to well-being, such as life satisfaction (e.g., Wanberg et al., 2020), or home-related parallels of work effort (e.g., family engagement; Ilies, Liu, Liu, & Zheng, 2017), would provide a more comprehensive picture of how contact with nature impacts employees.

Third, our findings provided fairly limited support for the interactive effect of evening nature contact and nature connectedness on depletion. Yet despite only finding statistical evidence of this effect in Study 2, there is reason to believe that there are boundary conditions that would activate or suppress the attention restoring effects of evening nature contact, as reflected by reduced depletion. For example, on days or in jobs that require relatively low cognitive demands, employees may be in a less cognitively depleted state at the end of their workday, thereby leaving little room for contact with nature in the evening to replenish these resources (e.g., Prem, Kubicek, Diestel, & Korunka, 2016; Sonnentag & Zijlstra, 2006). In these instances, even a great deal of contact with nature may not meaningfully change their overall level of depletion. Likewise, in jobs or on days in which employees engage in other restorative experiences for which we did not control, especially toward the end of their workday (e.g., happy hour with friends), they may return home from work in a replenished cognitive state, in which case further time spent in their evenings will have little room to further restore them (Kim, Cho, & Park, 2022). We thus encourage future research to consider job or day-level factors that may shape whether and when employees encounter a cognitively replenishing effect of evening contact with nature.

Fourth, in our paper we studied nature contact broadly; however, recent theoretical developments suggest that the effects of evening contact likely differ to the extent to which they

engage multiple senses. Drawing from the environmental psychology literature, Klotz and Bolino (2021) proposed that to the extent to which contact with nature is multisensory, its effects will be strengthened. In the context of the interaction between evening nature contact and nature connectedness, this prediction suggests a potential three-way interaction that includes how many senses are engaged in a given episode of nature contact. Similarly, our paper primarily examined the pleasant side of evening nature contact. Of course, the reality is that natural elements can be unpleasant, dangerous, or harmful, and therefore contact with it could in some cases cause negative affect or increased depletion. To gain a wholistic understanding of the effects of nature contact on employees, we also urge researchers to study this less pleasant side of nature, to determine the extent to which the benefits of nature observed in this paper remain present, if at all, alongside the likely negative consequences.

Fifth, in our three studies, our focus was to examine the effects of contact with nature in the evening on next morning PA and depletion. While after work hours in the evening are when many employees have time to spend time in nature, employees may also have contact with nature in the morning before work and during the workday. Even though we accounted for the possibility of contact with nature at different time points affecting our proposed relationships in Study 1, it may be possible that contact with nature in these time points have accumulation effects. That is, researchers may examine whether the effect of contact with nature in the evening on next day outcomes are strengthened or weakened when individuals also have morning contact with nature or when their workplaces include natural elements.

Finally, the biophilia hypothesis, and almost all of the research stemming from it, conceptualizes contact with nature as an almost unilaterally positive experience. In line with this notion, our operationalization of nature focused on fairly benign forms of contact with nature,

and our findings indicated that even for those who are low in nature connectedness, nature contact was not harmful. However, nature can also be a source of stress and exhaustion for employees, such as when severe weather threatens their commute, when thunderstorms disrupt their sleep, or when slick sidewalks create safety hazards at work. Indeed, for those reading this in the winter in a cold climate, nature may appear to be more harmful than helpful this time of year. We encourage future research to take a more balanced approach and build and test theory that includes potential drawbacks of contact with nature for employees and firms.

Conclusion

Organizational researchers are increasingly recognizing the ways in which exposure to nature benefits employees at work. However, extant research has tended to overlook the reality that many employees are not able to experience nature as part of their jobs, and that not all employees feel equally connected to the natural world. In this paper, we examined whether employees can access the benefits of contact with nature by spending with nature in the evening, after the work day. Across three studies, our findings indicated that evening nature contact does relate to employee PA, and possibly lower depletion, the following morning, which fuels subsequent work effort. Importantly, though, these effects were only experienced by employees who were high in nature connectedness. Together, these results highlight the power of nature's positive effects on employees, as well as its limits, depending on employees' dispositions.

REFERENCES

Amabile, T. M. 1982. Social psychology of creativity: A consensual assessment technique. *Journal of Personality and Social Psychology*, 43: 997-1013.

Barnes, C. M., Guarana, C. L., Nauman, S., & Kong, D. T. 2016. Too tired to inspire or be inspired: Sleep deprivation and charismatic leadership. *Journal of Applied Psychology,* 101: 1191-1199.

Beal, D. J., & Ghandour, L. 2011. Stability, change, and the stability of change in daily workplace affect. *Journal of Organizational Behavior,* 32: 526-546.

Berg, J. M. 2019. When silver is gold: Forecasting the potential creativity of initial ideas. *Organizational Behavior and Human Decision Processes,* 154: 96-117.

Berman, M. G., Jonides, J., & Kaplan, S. 2008. The cognitive benefits of interacting with nature. *Psychological Science*, 19: 1207-1212.

Binnewies, C., Sonnentag, S., & Mojza, E. J. 2009. Daily performance at work: Feeling recovered in the morning as a predictor of day-level job performance. *Journal of Organizational Behavior,* 30: 67-93.

Bratman, G. N., Hamilton, J. P., Hahn, K. S., Daily, G. C., & Gross, J. J. 2015. Nature experience reduces rumination and subgenual prefrontal cortex activation. *Proceedings of the National Academy of Sciences,* 112: 8567-8572.

Cho, S., & Kim, S. 2022. Does a healthy lifestyle matter? A daily diary study of unhealthy eating at home and behavioral outcomes at work. *Journal of Applied Psychology,* 107: 23-39.

De Jong, B. A., & Elfring, T. 2010. How does trust affect the performance of ongoing teams? The mediating role of reflexivity, monitoring, and effort. *Academy of Management Journal*, 53: 535-549.

Edwards, J. 2008. Seven deadly myths of testing moderation in organizational research. In C. E. Lance, & R. J. Vandenberg (Eds.), *Statistical and methodological myths and urban legends: Doctrine, verity, and fable in the organizational and social sciences:* 143-164. New York, NY: Routledge.

Feuerhahn, N., Sonnentag, S., & Woll, A. 2014. Exercise after work, psychological mediators, and affect: A day-level study. *European Journal of Work and Organizational Psychology*, 23: 62-79.

Fredrickson, B. L. 1998. What good are positive emotions. *Review of General Psychology,* 2: 300-319.

Gabriel, A. S., Koopman, J., Rosen, C. C., & Johnson, R. E. 2018. Helping others or helping oneself? An episodic examination of the behavioral consequences of helping at work. *Personnel Psychology,* 71: 85-107.

Gabriel, A. S., Podsakoff, N. P., Beal, D. J., Scott, B. A., Sonnentag, S., Trougakos, J. P., & Butts, M. M. 2019. Experience sampling methods: A discussion of critical trends and considerations for scholarly advancement. *Organizational Research Methods,* 22: 969-1006.

Geurts, S. A. E., & Sonnentag, S. 2006. Recovery as an explanatory mechanism in the relation between acute stress reactions and chronic health impairment. *Scandinavian Journal of Work, Environment & Health,* 32: 482-492.

Gilbert, E., Foulk, T., & Bono, J. 2018. Building personal resources through interventions: An integrative review. *Journal of Organizational Behavior,* 39: 214-228.

Halbesleben, J. R. B., Harvey, J., & Bolino, M. C. 2009. Too engaged? A conservation of resources view of the relationship between work engagement and work interference with family. *Journal of Applied Psychology*, 94: 1452-1465.

Hartig, T., Mitchell, R., Vries, S. d., & Frumkin, H. 2014. Nature and health. *Annual Review of Public Health,* 35: 207-228.

Hobfoll, S. E. 2001. The influence of culture, community, and the nested-self in the stress process: Advancing conservation of resources theory. *Applied Psychology*, 50: 337-421.

Hobfoll, S. E., Halbesleben, J., Neveu, J. P., & Westman, M. 2018. Conservation of resources in the organizational context: The reality of resources and their consequences. *Annual Review of Organizational Psychology and Organizational Behavior*, 5: 103-128.

Hofmann, D. A., Griffin, M. A., & Gavin, M. B. 2000. The application of hierarchical linear modeling to organizational research. In K. J. Klein & S. W. J. Kozlowski Eds., *Multilevel theory, research, and methods in organizations:* 467-511. Jossey-Bass.

Hunter, S. T., Cushenbery, L. D., & Jayne, B. 2017. Why dual leaders will drive innovation: Resolving the exploration and exploitation dilemma with a conservation of resources solution. *Journal of Organizational Behavior,* 38: 1183-1195.

Hur, W. M., Shin, Y., & Moon, T. W. 2020. How does daily performance affect next-day emotional labor? The mediating roles of evening relaxation and next-morning positive affect. *Journal of Occupational Health Psychology*, 25: 410-425.

Ilies, R., Liu, X. Y., Liu, Y., & Zheng, X. 2017. Why do employees have better family lives when they are highly engaged at work?. *Journal of Applied Psychology*, 102: 956-970.

Ilies, R., Schwind, K. M., Wagner, D. T., Johnson, M. D., DeRue, D. S., & Ilgen, D. R. 2007. When can employees have a family life? The effects of daily workload and affect on work-family conflict and social behaviors at home. *Journal of Applied Psychology,* 92: 1368-1379.

Johnson, R. E., Lanaj, K., & Barnes, C. M. 2014. The good and bad of being fair: Effects of procedural and interpersonal justice behaviors on regulatory resources. *Journal of Applied Psychology,* 96: 635-650.

Johnson, R. E., Lin, S. H., & Lee, H. W. 2018. Self-control as the fuel for effective self-regulation at work: Antecedents, consequences, and boundary conditions of employee self-control. In *Advances in motivation science,* vol. 14: 87-128. Elsevier.

Joye, Y., & Dewitte, S. 2018. Nature's broken path to restoration. A critical look at Attention Restoration Theory. *Journal of Environmental Psychology,* 59: 1-8.

Kaplan, S. 1995. The restorative benefits of nature: Toward an integrative framework. *Journal of Environmental Psychology,* 15: 169-182.

Kaplan, S., & Berman, M. G. 2010. Directed attention as a common resource for executive functioning and self-regulation. *Perspectives on Psychological Science,* 5: 43-57.

Kellert, S. R., Heerwagen, J., & Mador, M. 2008. *Bringing buildings to life: The theory and practice of biophilic building design.* Wiley.

Kim, S., Cho, S., & Park, Y. 2022. Daily microbreaks in a self-regulatory resources lens: Perceived health climate as a contextual moderator via microbreak autonomy. *Journal of Applied Psychology*, 107: 60-77.

Klepeis, N. E., Nelwon, W. C., Ott, W. R., Robinson, J. P., Tsang, A. M., Switzer, P., Behar, J.V., Hern, S. C., & Engelmann, W. H. 2001. The National Human Activity Pattern NHAPS: A resource for assessing exposure to environmental pollutants. *Journal of Exposure Analysis and Environmental Epidemiology*, 11: 231-252.

Klotz, A. C. 2020. Creating jobs and workspaces that energize people. *MIT Sloan Management Review,* 614: 74-78.

Klotz, A. C., & Bolino, M. C. 2021. Bringing the great outdoors into the workplace: The energizing effect of biophilic work design. *Academy of Management Review,* 46: 231-251.

Knez, I., Thorsson, S., Eliasson, I., & Lindberg, F. 2009. Psychological mechanisms in outdoor place and weather assessment: towards a conceptual model. *International Journal of Biometeorology*, 53: 101-111.

Kohll, A. 2018, June 28. 5 Data-backed ways working outdoors can improve employee well-being. https://www.forbes.com/sites/alankohll/2018/06/25/5-data-backed-ways-working-outdoors-can-improve-employee-well-being/

Korpela, K., De Bloom, J., & Kinnunen, U. 2015. From restorative environments to restoration in work. *Intelligent Buildings International,* 7: 215-223.

Korpela, K., De Bloom, J., Sianoja, M., Pasanen, T., & Kinnunen, U. 2017. Nature at home and at work: Naturally good? Links between window views, indoor plants, outdoor activities and employee well-being over one year. *Landscape and Urban Planning,* 160: 38-47.

Kotabe, H. P., & Hofmann, W. 2015. On integrating the components of self-control. *Perspectives on Psychological Science*, 10: 618-638.

Lanaj, K., Johnson, R. E., & Barnes, C. M. 2014. Beginning the workday yet already depleted? Consequences of late-night smartphone use and sleep. *Organizational Behavior and Human Decision Processes,* 124: 11-23.

Largo-Wight, E., Chen, W. W., Dodd, V., & Weiler, R. 2011. The nature contact questionnaire: A measure of healthy workplace exposure. *Work*, 40: 411-423.

Larsen, L., Adams, J., Deal, B., Kweon, B. S., & Tyler, E. 1998. Plants in the workplace. *Environment and Behavior,* 30: 261-281.

Leavitt, K., Barnes, C. M., Watkins, T., & Wagner, D. T. 2017. From the bedroom to the office: Workplace spillover effects of sexual activity at home. *Journal of Management,* 45: 1173-1192.

LeBreton, J. M., & Senter, J. L. 2008. Answers to 20 questions about interrater reliability and interrater agreement. *Organizational Research Methods*, 11: 815-852.

Li, D., Deal, B., Zhou, X., Slavenas, M., & Sullivan, W. C. 2018. Moving beyond the neighborhood: Daily exposure to nature and adolescents' mood. *Landscape and Urban Planning*, 173, 33-43.

Liu, Y., Song, Y., Koopmann, J., Wang, M., Chang, C.-H. (D.), & Shi, J. 2017. Eating your feelings? Testing a model of employees' work-related stressors, sleep quality, and unhealthy eating. *Journal of Applied Psychology,* 102: 1237-1258.

MacKinnon, A., Jorm, A. F., Christensen, H., Korten, A. E., Jacomb, P. A., & Rodgers, B. 1999. A short form of the positive and negative affect schedule: Evaluation of factorial validity and invariance across demographic variables in a community sample. *Personality and Individual Differences*, 27: 405-416.

Martin, L., White, M. P., Hunt, A., Richardson, M., Pahl, S., & Burt, J. 2020. Nature contact, nature connectedness and associations with health, wellbeing and pro-environmental behaviours. *Journal of Environmental Psychology,* 68: 101389.

Matta, F. K., Scott, B. A., Colquitt, J. A., Koopman, J., & Passantino, L. G. 2017. Is consistently unfair better than sporadically fair? An investigation of justice variability and stress. *Academy of Management Journal*, 60: 743-770.

Mayer, F. S., & Frantz, C. M. 2004. The connectedness to nature scale: A measure of individuals' feeling in community with nature. *Journal of Environmental Psychology,* 24: 503-515.

Mayer, F. S., Frantz, C. M., Bruehlman-Senecal, E., & Dolliver, K. 2009. Why is nature beneficial? *Environment and Behavior,* 41: 607-643.

Meijman, T. F., & Mulder, G. 1998. Psychological aspects of workload. In P. J. D. Drenth & H. Thierry (Eds.), *Handbook of work and organizational psychology:* Hove: Psychology Press/Erlbaum Taylor and Francis.

Moljord, I. E. O., Eriksen, L., Moksnes, U. K., & Espnes, G. A. 2011. Stress and happiness among adolescents with varying frequency of physical activity. *Perceptual and Motor Skills*, 113: 631-646.

Muthén, L. K., & Muthén, B. O. 2017. *Mplus user's guide*. Muthén & Muthén.

Nieuwenhuis, M., Knight, C., Postmes, T., & Haslam, S. A. 2014. The relative benefits of green versus lean office space: Three field experiments. *Journal of Experimental Psychology: Applied,* 20: 199-214.

Nisbet, E. K., Zelenski, J. M., & Murphy, S. A. 2011. Happiness is in our nature: Exploring nature relatedness as a contributor to subjective well-being. *Journal of Happiness Studies,* 12: 303-322.

Ouyang, K., Cheng, B. H., Lam, W., & Parker, S. K. 2019. Enjoy your evening, be proactive tomorrow: How off-job experiences shape daily proactivity. *Journal of Applied Psychology,* 104: 1003-1019.

Preacher, K. J., Rucker, D. D., & Hayes, A. F. 2007. Addressing moderated mediation hypotheses: Theory, methods, and prescriptions. *Multivariate Behavioral Research,* 42: 185-227.

Preacher, K. J., Zyphur, M. J., & Zhang, Z. 2010. A general multilevel SEM framework for assessing multilevel mediation. *Psychological Methods,* 15: 209-233.

Prem, R., Kubicek, B., Diestel, S., & Korunka, C. 2016. Regulatory job stressors and their within-person relationships with ego depletion: The roles of state anxiety, self-control effort, and job autonomy. *Journal of Vocational Behavior,* 92: 22-32.

Raanaas, R. K., Evensen, K. H., Rich, D., Sjøstrøm, G., & Patil, G. 2011. Benefits of indoor plants on attention capacity in an office setting. *Journal of Environmental Psychology,* 31: 99-105.

Russell, R., Guerry, A. D., Balvanera, P., Gould, R. K., Basurto, X., Chan, K. M. A., Klain, S., Levine, J., & Tam, J. 2013. Humans and nature: How knowing and experiencing nature affect well-being. *Annual Review of Environment and Resources,* 38: 473-502.

Salanova, M., Agut, S., & Peiró, J. M. 2005. Linking organizational resources and work engagement to employee performance and customer loyalty: The mediation of service climate. *Journal of Applied Psychology,* 90: 1217-1227.

Schertz, K. E., & Berman, M. G. 2019. Understanding nature and its cognitive benefits. *Current Directions in Psychological Science*, 28: 496-502.

Schutte, N. S., Bhullar, N., Stilinović, E. J., & Richardson, K. 2017. The impact of virtual environments on restorativeness and affect. *Ecopsychology*, 9: 1-7.

Scott, B. A., & Judge, T. A. 2006. Insomnia, emotions, and job satisfaction: A multilevel study. *Journal of Management*, 32: 622-645.

Seppälä, E., & Berlin, J. 2017, November 17. Why you should tell your team to take a break and go outside. https://hbr.org/2017/06/why-you-should-tell-your-team-to-take-a-break-and-go-outside

Sherf, E. N., & Morrison, E. W. 2020. I do not need feedback! Or do I? Self-efficacy, perspective taking, and feedback seeking. *Journal of Applied Psychology*, 105: 146-165.

Sianoja, M., Syrek, C. J., de Bloom, J., Korpela, K., & Kinnunen, U. 2018. Enhancing daily well-being at work through lunchtime park walks and relaxation exercises: Recovery experiences as mediators. *Journal of Occupational Health Psychology*, 23: 428-442.

SimanTov-Nachlieli, I., & Bamberger, P. 2021. Pay communication, justice, and affect: The asymmetric effects of process and outcome pay transparency on counterproductive workplace behavior. *Journal of Applied Psychology*, 106: 230-249.

Sonnentag, S. 2001. Work, recovery activities, and individual well-being: A diary study. *Journal of Occupational Health Psychology*, 6: 196-210.

Sonnentag, S. 2018. The recovery paradox: Portraying the complex interplay between job stressors, lack of recovery, and poor well-being. *Research in Organizational Behavior*, 38: 169-185.

Sonnentag, S., Binnewies, C., & Mojza, E. J. 2008 "Did you have a nice evening?" A day-level study on recovery experiences, sleep, and affect. *Journal of Applied Psychology*, 93: 674-684.

Sonnentag, S., Eck, K., Fritz, C., & Kühnel, J. 2020. Morning reattachment to work and work engagement during the day: A look at day-level mediators. *Journal of Management*, 46: 1408-1435.

Sonnentag, S., & Fritz, C. 2007. The Recovery Experience Questionnaire: development and validation of a measure for assessing recuperation and unwinding from work. *Journal of Occupational Health Psychology*, 12: 204-221.

Sonnentag, S., Mojza, E. J., Binnewies, C., & Scholl, A. 2008. Being engaged at work and detached at home: A week-level study on work engagement, psychological detachment, and affect. *Work & Stress*, 22: 257-276.

Sonnentag, S., Venz, L., & Casper, A. 2017. Advances in recovery research: What have we learned? What should be done next? *Journal of Occupational Health Psychology,* 22: 365-380.

Sonnentag, S., & Zijlstra, F. R. 2006. Job characteristics and off-job activities as predictors of need for recovery, well-being, and fatigue. *Journal of Applied Psychology*, 91: 330-350.

Stewart, W., & Barling, J. 1996. Daily work stress, mood and interpersonal job performance: A mediational model. *Work & Stress*, 10: 336-351.

Stone, A. A., & Neale, J. M. 1984. Effects of severe daily events on mood. *Journal of Personality and Social Psychology*, 46: 137-144.

Stringer, L. 2018, July 12. Why more companies are encouraging outdoor work. https://slate.com/human-interest/2018/07/why-working-outdoors-is-healthy-for-workers-and-probably-good-for-business.html

Tang, P. M., Koopman, J., McClean, S. T., Zhang, J. H., Li, C. H., De Cremer, D., ... & Ng, C. T. S. 2021. When conscientious employees meet intelligent machines: An integrative approach inspired by complementarity theory and role theory. *Academy of Management Journal*, Online advance version. https://journals.aom.org/doi/abs/10.5465/amj.2020.1516

ten Brummelhuis, L. L., & Bakker, A. B. 2012. Staying engaged during the week: The effect of off-job activities on next day work engagement. *Journal of Occupational Health Psychology*, 17: 445-455

ten Brummelhuis, L. L., & Trougakos, J. P. 2014. The recovery potential of intrinsically versus extrinsically motivated off-job activities. *Journal of Occupational and Organizational Psychology*, 87: 177-199.

Tang, P. M., Koopman, J., McClean, S. T., Zhang, J. H., Li, C. H., De Cremer, D., ... & Ng, C. T. S. (2021). When conscientious employees meet intelligent machines: An integrative approach inspired by complementarity theory and role theory. *Academy of Management Journal*, Online Advance Version.

The School of Life 2016. *Great thinkers*. The School of Life press.

Thompson, A., & Bruk-Lee, V. 2019. Naturally! Examining nature's role in workplace strain reduction. *Occupational Health Science,* 3: 23-43.

Thompson, D. 2020, August 06. The workforce is about to change dramatically. https://www.theatlantic.com/ideas/archive/2020/08/just-small-shift-remote-work-could-change-everything/614980/

Trougakos, J. P., Beal, D. J., Green, S. G., & Weiss, H. M. 2008. Making the break count: An episodic examination of recovery activities, emotional experiences, and positive affective displays. *Academy of Management Journal,* 51: 131-146.

Twohig-Bennett, C., & Jones, A. 2018. The health benefits of the great outdoors: A systematic review and meta-analysis of greenspace exposure and health outcomes. *Environmental Research,* 166: 628-637.

Ulrich, R. S. 1983. Aesthetic and affective response to natural environment. In I. Altman & J. F. Wohlwill (Eds.), *Behavior and the natural environment:* 85-125. New York, NY: Springer.

Wanberg, C. R., Csillag, B., Douglass, R. P., Zhou, L., & Pollard, M. S. 2020. Socioeconomic status and well-being during COVID-19: A resource-based examination. Journal of Applied Psychology, 105: 1382-1396.

Wang, M., Liao, H., Zhan, Y. J., & Shi, J. Q. 2011. Daily customer mistreatment and employee sabotage against customers: Examining emotion and resource perspectives. *Academy of Management Journal*, 54: 312-334.

Wilson, E.O. 1984. *Biophilia.* Harvard University Press.

Wolsko, C., & Lindberg, K. 2013. Experiencing connection with nature: The matrix of psychological well-being, mindfulness, and outdoor recreation. *Ecopsychology*, 5: 80-91.

Yoon, S., McClean, S. T., Chawla, N., Kim, J. K., Koopman, J., Rosen, C. C., Trougakos, J. P., & McCarthy, J. M. 2021. Working through an "infodemic": The impact of COVID-19 news consumption on employee uncertainty and work behaviors. *Journal of Applied Psychology,* 106: 501-517.

Zadeh, R. S., Shepley, M. M., Williams, G., & Chung, S. S. E. 2014. The impact of windows and daylight on acute-care nurses' physiological, psychological, and behavioral health. *HERD: Health Environments Research & Design Journal*, 7: 35-61.

Zijlstra, F. R. H., Cropley, M., & Rydstedt, L. W. 2014 From recovery to regulation: An attempt to reconceptualize 'recovery from work'. *Stress and Health*, 30: 244-252.

Zohar, D., Tzischinski, O., & Epstein, R. 2003. Effects of energy availability on immediate and delayed emotional reactions to work events. *Journal of Applied Psychology,* 88: 1082-1093.

Table 1

Descriptive Statitstics and Correlations among Study Variables (Study 1)

Variable	*M*	*SD*	σ^2	τ_{00}	Percentage of within-person variance	1	2	3	4	5
Within-person variables										
1. Evening nature contact	0.84	0.87	.43	.33	57%	-				
2. Daily positive affect	2.93	1.18	.38	.97	28%	.05	(.94)			
3. Daily depletion	1.54	0.81	.27	.38	42%	-.02	-.43*	(.94)		
4. Daily work effort	3.57	1.16	.66	.71	48%	.01	.12*	-.11*	(.98)	
Between-person variables										
5. Nature connectedness	3.41	0.64	-	-	-	.14	.05	.01	.20*	(.87)

Notes: Level 1 N=1570; Level 2 N=199. Average reliabilities are reported in parentheses on the diagonal.
*****$p < .05$
σ^2: Within-person (Level 1) variance
τ_{00}: Between-person (Level 2) variance

Table 2

Daily Path Analytic Results (Study 1)

	Daily Outcome Variable					
	Positive Affect		Depletion		Work Effort	
Predictor Variable	γ	*SE*	γ	*SE*	γ	*SE*
Control Variables						
Weekday	.02	(.05)	.03	(.04)	-.07	(.08)
Weekday (sine)	.01	(.03)	.01	(.02)	-.08	(.05)
Weekday (cosine)	.02	(.07)	-.03	(.06)	.03	(.11)
Study day	.01	(.00)	-.00	(.00)	-.01	(.01)
Sleep quality	.25*	(.03)	-.30*	(.03)	-.03	(.04)
Morning nature contact	.15	(.09)	-.03	(.05)	-.04	(.12)
Lagged workplace nature exposure (prior day)	-.06	(.03)	.02	(.04)	-.06	(.05)
Lagged positive affect	.16*	(.04)	.03	(.03)	-.01	(.04)
Lagged depletion	.11*	(.04)	-.02	(.05)	-.05	(.04)
Lagged work effort	.04	(.02)	-.03*	(.02)	.04	(.04)
Daily workplace nature exposure					.00	(.04)
Daily workplace natural views					.03	(.03)
Daily workplace natural element exposure					-.03	(.04)
Study Variables						
Evening nature contact	.05	(.03)	-.03	(.02)	.00	(.03)
Nature connectedness	.08	(.14)	-.01	(.10)	.27*	(.10)
Evening nature contact x nature connectedness	.07*	(.04)	.02	(.04)	.05	(.06)
Daily positive affect					.13*	(.06)
Daily depletion					-.12*	(.06)
Pseudo R-squared	.13		.15		.04	

Notes: Level 1 N=1570; Level 2 N=199. Unstandardized coefficients shown.
*****$p < .05$

Table 3

Conditional Indirect Effect Results (Study 1)

Path	Indirect Effect	Conditional Indirect Effect
Evening nature contact → Daily positive Affect → Daily work effort		
Nature connectedness	.006 [.000, .019]	
High		**.012 [.002, .032]**
Low		.000 [-.011, .008]
Difference		**.012 [.001, .036]**
Evening nature contact → Daily depletion → Daily work effort		
Nature connectedness	.003 [-.001, .013]	
High		.002 [-.006, .015]
Low		.004 [-.002, .018]
Difference		-.003 [-.020, .009]

Notes: Indirect effects in boldface indicate effects significant at the 95% level. 95% bias-corrected confidence intervals shown.

Table 4

Descriptive Statitstics and Correlations among Study Variables (Study 2)

	M	*SD*	1	2	3	4	5	6
1. Nature condition	.50	.50	-					
2. Nature connectedness	3.41	.61	.09	-				
3. Positive affect	3.01	.93	.09	.10	-			
4. Depletion	2.13	1.05	-.13	-.12	-.33*	-		
5. Detachment (Alternative mechanism)	2.86	1.06	.00	.03	.19*	-.26*	-	
6. Work effort	3.74	.87	.14	.08	.38*	-.37*	.10	-

Note. N = 155. Nature condition: Control condition = 0; Nature condition = 1

* $p < .05$

Table 5

Results of Path Analysis (Study 2)

Variables	Positive Affect		Depletion		Detachment (Alternative mechanism)		Work Effort	
	B	SE	*B*	SE	*B*	SE	*B*	SE
Intercept								
Nature condition	.15	(.15)	-.25	(.16)	-.00	(.17)	.14	(.13)
Nature connectedness	-.11	(.16)	.14	(.18)	-.17	(.19)	-.02	(.14)
Nature condition x nature connectedness	.55*	(.24)	-.72*	(.27)	.49	(.28)	.09	(.21)
Positive affect							.26*	(.07)
Depletion							-.22*	(.07)
Detachment (Alternative mechanism)							-.02	(.06)
Pseudo R-squared	.05		.07		.02		.21	

Note. N = 155. Nature condition: Control condition = 0; Nature condition = 1

* $p < .05$

Table 6

Conditional Indirect Effect Results (Studies 2 and 3)

Path	Indirect Effect	Conditional Indirect Effect
Study 2		
Evening nature contact → Positive affect → Work effort	.039 [-.029, .136]	
Nature connectedness		
High		**.128 [.027, .292]**
Low		-.049 [-.187, .050]
Difference		**.177 [.033, .415]**
Evening nature contact → Depletion → Work effort	.053 [-.008, .155]	
Nature connectedness		
High		**.147 [.044, .322]**
Low		-.042 [-.174, .051]
Difference		**.189 [.047, .429]**
Study 3		
Evening nature contact → Positive affect → Work effort	**.073 [.019, .163]**	
Nature connectedness		
High		**.121 [.053, .224]**
Low		.025 [-.028, .095]
Difference		**.096 [.037, .193]**
Evening nature contact → Depletion → Work effort	.003 [-.048, .055]	
Nature connectedness		
High		.024 [-.022, .082]
Low		-.017 [-.072, .031]
Difference		.040 [-.005, .103]

Notes: Indirect effects in boldface indicate effects significant at the 95% level. 95% bias-corrected confidence intervals shown.

Table 7

Descriptive Statitstics and Correlations among Study Variables (Study 3)

	M	*SD*	1	2	3	4	5	6	7	8	9	10	11	12
1. Gender (Control)	.50	.50	-											
2. Age (Control)	33.80	9.15	-.24*	-										
3. Physical activity (Control)	1.99	1.38	.01	-.00	-									
4. Unhealthy eating (Control)	2.43	1.12	.06	-.05	.13	-								
5. Stress (Control)	3.00	1.11	.07	-.17*	.12	.09	-							
6. Weather (Control)	3.90	.92	.15*	.11	.19*	.11	.09	-						
7. Evening nature contact	2.07	.60	.10	.08	.28*	.19*	.01	.16*	-					
8. Nature connectedness	3.47	.59	.00	.15	.23*	.02	-.02	.16*	.33*	-				
9. Positive affect	2.65	.81	-.07	.06	.32*	-.01	-.24*	.11	.33*	.30*	-			
10. Depletion	2.37	1.10	.17*	-.19*	-.15*	.12	.42*	-.11	-.07	-.14	-.48*	-		
11. Detachment (Alternative mechanism)	2.67	.98	-.05	.20*	.05	.00	-.29*	.09	.07	.14	.23*	-.20*	-	
12. Work performance	3.25	.79	.08	.15*	.15*	-.02	-.14	.15*	.18*	.18*	.47*	-.46*	.22*	-

Note. Gender: Male = 0, Female = 1
N = 183. * $p \leq .05$

Table 8

Results of Path Analysis (Study 3)

Variables	Positive Affect		Depletion		Detachment (Alternative mechanism)		Work Effort	
	B	SE	*B*	SE	*B*	SE	*B*	SE
Intercept								
Evening nature contact	.25*	.10	-.01	.13	.01	.13	.01	.09
Nature connectedness	.24*	.09	-.12	.13	.15	.13	.02	.09
Evening nature contact x nature connectedness	.28*	.14	-.13	.19	.03	.18	.11	.13
Controls								
Physical activity	.15*	.04	-.14*	.05	.03	.05	-.02	.04
Unhealthy eating	-.04	.05	.11	.06	.01	.06	.01	.04
Stress	-.19*	.05	.41*	.06	-.24*	.06	.09	.05
Weather	.03	.06	-.15	.08	.08	.08	.02	.06
Gender	-.16	.11	.33*	.15	-.01	.15	.27*	.10
Age	-.01	.01	-.01	.01	.01	.01	.01	.01
Mediators								
Positive affect							.30*	.08
Depletion							-.26*	.05
Detachment (Alternative mechanism)							.08	.05
Pseudo R-squared	.29		.28		.13		.35	

Note. N = 183. Gender: Male = 0, Female = 1

*$p < .05$

Figure 1

Conceptual Model

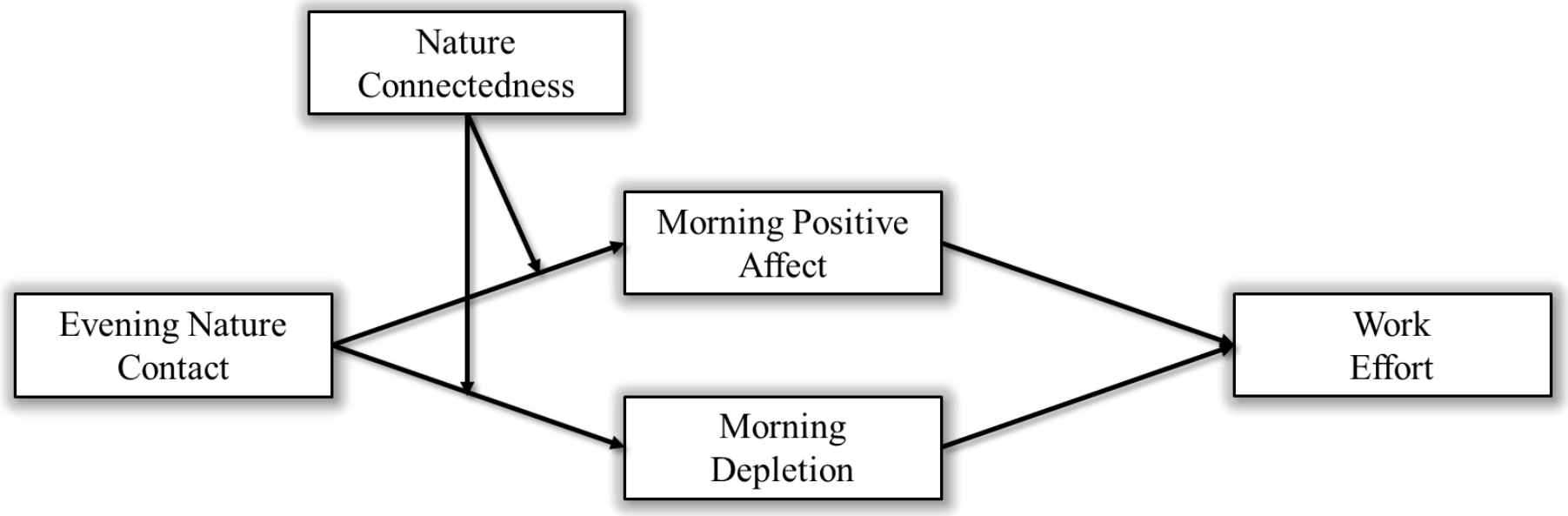


Figure 2

Moderating Effect of Nature Connectedness on the Relationship between Evening Nature Contact and Daily Positive Affect (Study 1)

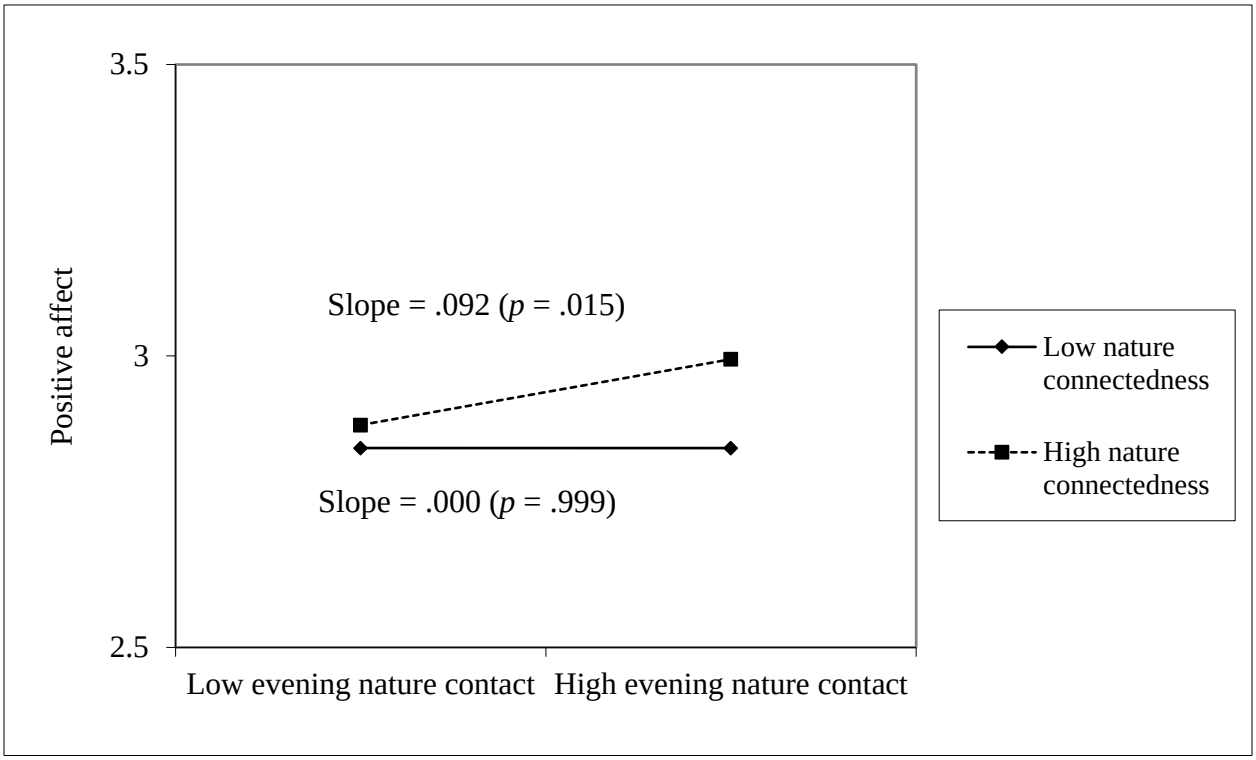
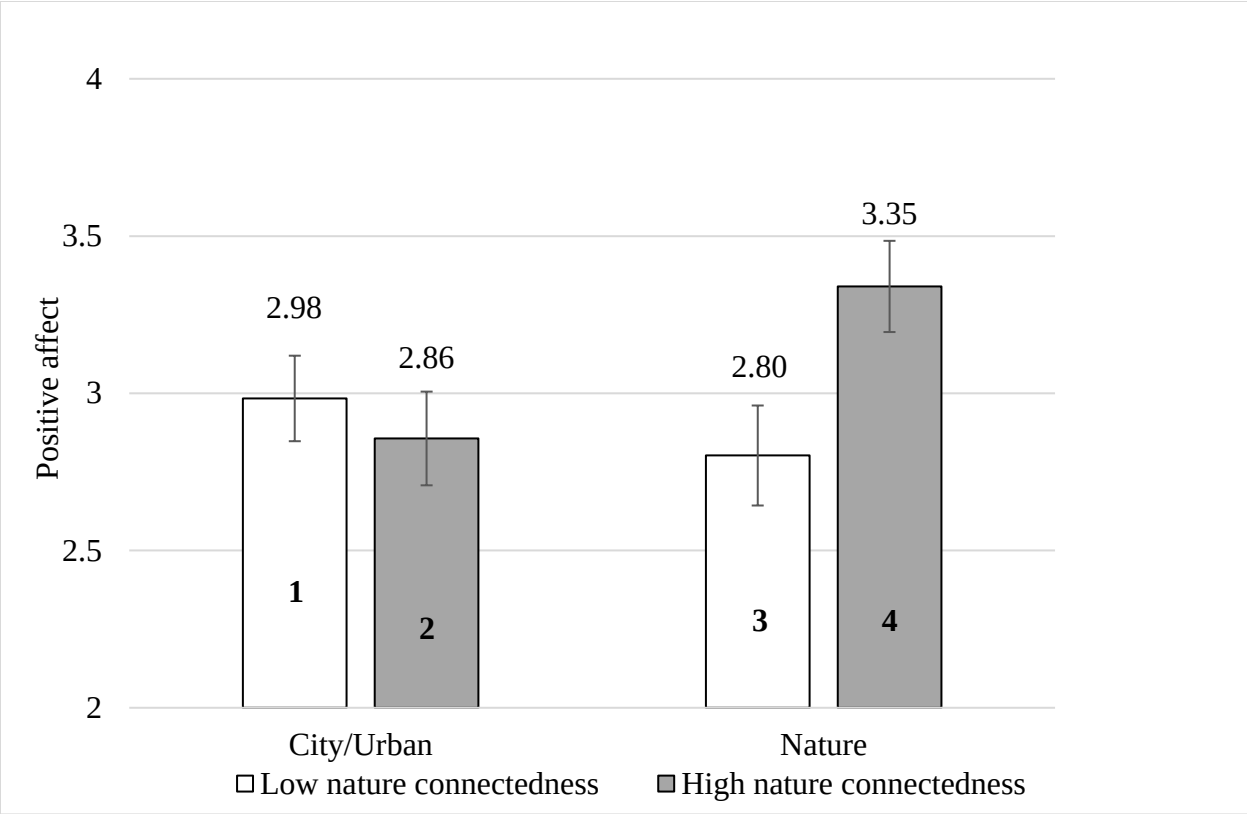


Figure 3

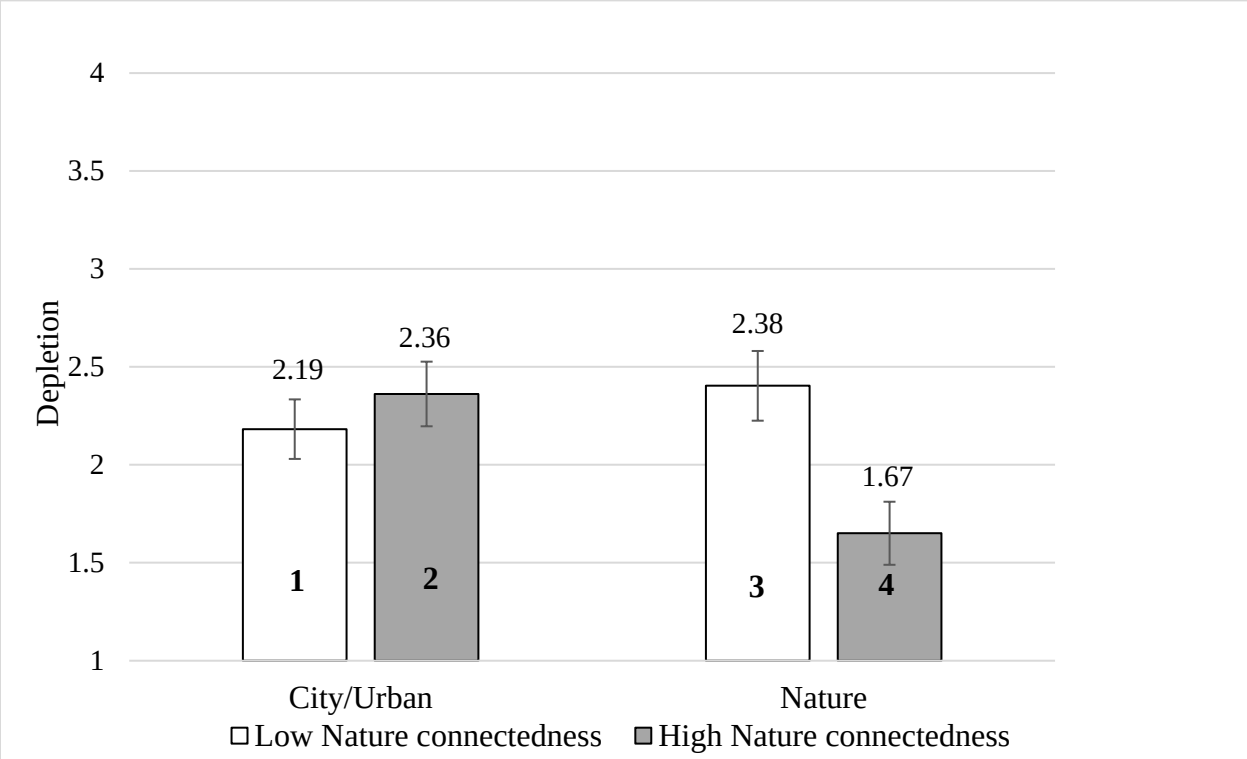
Moderating Effect of Nature Connectedness on the Relationship between Evening Nature Contact and Positive Affect (Study 2)



Note.
Error bars indicate standard errors around conditional means.
Difference between 1 and 2 (difference = -.129, p =.511)
Difference between 3 and 4 (difference = .547, p = .014)

Figure 4

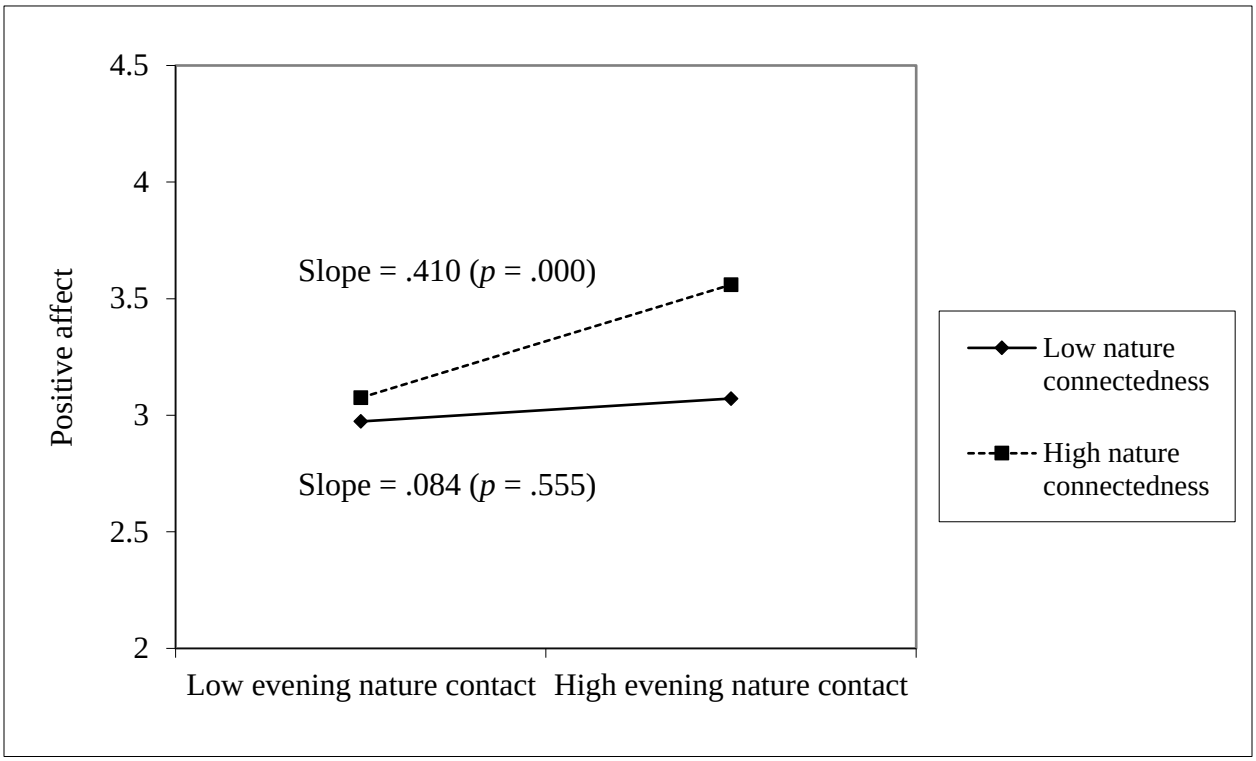
Moderating Effect of Nature Connectedness on the Relationship between Evening Nature Contact and Depletion (Study 2)



Note.
Error bars indicate standard errors around conditional means.
Difference between 1 and 2 (difference = .168, p =.443)
Difference between 3 and 4 (difference = -.706, p = .004)

Figure 5

Moderating Effect of Nature Connectedness on the Relationship between Evening Nature Contact and Positive Affect (Study 3)



Appendix

Photographs used for manipulation (Study 2)

Nature Condition	Control condition