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Promoting meaningful and positive nature interactions for visitors to green spaces

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Abstract: The increasing alienation of people from nature is profoundly concerning because people's interactions with nature affect well-being, affinity for nature, and support of biodiversity conservation. Efforts to restore or enhance people's interactions with nature are, therefore, important to ensure sustainable human and wildlife communities, but little is known about how this can be achieved. A key factor that shapes the way people interact with nature is their affinity for nature (often measured as nature relatedness [NR]). We explored how using cues to experience nature as a means to induce NR situationally can influence the quality of people's nature interactions on visits to green spaces and their positive affect after the visit. Cues to experience are cues that guide individuals on how to interact with nature. We surveyed 1023 visitors to a nature reserve to examine the relationships between trait (i.e., stable and long-lasting) and state (i.e., temporary, brief) NR, the quality of nature interactions, and positive affect. We also conducted a controlled experiment in which 303 participants spent 30 min outdoors on campus and reported the quality of their nature interactions and positive affect. Participants were randomly assigned to 1 of 9 cues-to-experience experimental groups (e.g., smell flowers, observe wildlife, turn off your phone) that differed in the psychological distance from nature that they prompted. Participants who received cues of close psychological distance from nature (e.g., smell and touch natural elements) interacted 3 to 4 times more with nature and reported 0.2 more positive affect than other participants. Our results demonstrate that providing cues to experience nature, which bring people closer to nature and potentially induce state NR, can enhance the quality of people's nature interactions and their positive affect. These results highlight the role of NR in high-quality nature interactions and suggest the use of cues to experience as a promising avenue for inducing state NR and promoting meaningful interactions with biodiversity, thus, reconciling conservation and well-being objectives.

Keywords: cues to experience, experience of nature, extinction of experience, happiness, inclusion of nature in self, nature relatedness, nature reserve, psychological distance

Fomento a las Interacciones Significativas y Positivas con la Naturaleza para los Visitantes a las Áreas Verdes

Resumen: El creciente distanciamiento entre las personas y la naturaleza genera una preocupación seria, pues las interacciones entre las personas y la naturaleza afectan al bienestar, la afinidad por la naturaleza y al apoyo para la conservación de la biodiversidad. Por lo tanto, los esfuerzos por restaurar o mejorar las interacciones entre las personas y la naturaleza son importantes para asegurar la existencia de comunidades sustentables de humanos y fauna. A pesar de esto, se conoce muy poco sobre cómo se puede lograr lo anterior. Un factor clave que define la manera en la que las personas interactúan con la naturaleza es su afinidad por la misma (la cual se mide generalmente como vínculo con la naturaleza [VN]). Exploramos cómo el uso de las pautas para experimentar la naturaleza como los medios para inducir el VN circunstancial puede influir sobre la calidad de las interacciones entre las personas y la naturaleza durante sus visitas a áreas verdes y el efecto positivo posterior a estas visitas. Las pautas experimentales son pautas que guían a los individuos sobre cómo deben interactuar con la naturaleza. Encuestamos a 1023 visitantes en una reserva natural para examinar las relaciones entre el rasgo (es decir, estable y de larga duración) y el estado (es decir, temporal, breve) del VN, la calidad de las interacciones con la naturaleza

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y el efecto positivo. También realizamos un experimento controlado en el cual 303 participantes pasaron 30 minutos en el exterior y reportaron la calidad de sus interacciones con la naturaleza y del efecto positivo. Los participantes fueron asignados al azar a uno de los nueve grupos de pautas experimentales (p. ej.: oler flores, observar fauna, apagar su teléfono celular) cuya diferencia era el distanciamiento psicológico con la naturaleza que pautaba. Los participantes que recibieron pautas de distancia psicológica próxima a la naturaleza (p. ej.: oler y tocar elementos naturales) interactuaron 3–4 veces más con la naturaleza y reportaron un efecto 0.2 más positivo que los demás participantes. Nuestros resultados demuestran que el fomento de pautas para experiencias con la naturaleza, las cuales acercan a las personas con la naturaleza y tienen el potencial para inducir un estado VN, pueden mejorar la calidad de las interacciones que tienen las personas con la naturaleza y su efecto positivo. Estos resultados resaltan el papel del VN en las interacciones de alta calidad con la naturaleza y sugieren que el uso de pautas exerimentale es una vía prometedora para inducir el estado VN y promover las interacciones significativas con la biodiversidad, reconciliando así a la conservación con los objetivos de bienestar.

Palabras Clave: experiencia con la naturaleza, extinción de la experiencia, distancia psicológica, felicidad, inclusión de la naturaleza en el ser, pautas para la experiencia, reserva natural, vínculo con la naturaleza

摘要: 人类对自然日益疏远的现象令人深感忧虑, 因为人类与自然的互动影响着人类的福祉、对自然的亲近以及对生物多样性保护的支持。因此, 努力恢复或加强人类与自然互动对确保人类和野生动物群落的可持续发展至关重要。然而, 人们对如何实现这一目标仍知之甚少。塑造人与自然互作方式的一个关键因素是人们对自然的亲近感 (通常用自然联结来衡量) 。本研究探索了引导式自然体验作为在情境中激发自然联结的方法, 是如何影响人们游览绿地时与自然互动的质量以及游览后的积极作用的。引导式体验可以指引人们如何与自然互动。我们调查了一个自然保护区的 1023 名游客, 以研究特质自然联结 (稳定性和持久性) 与状态自然联结 (暂时性和短暂性) 、与自然互作的质量和积极影响之间的关系。我们还进行了一项控制实验, 要求 303 名参与者在校园的户外待 30 分钟, 并报告他们与自然互动质量和积极影响。参与者被随机分配到引导式自然体验 (如闻花香、观察野生动物、关掉手机) 的九个实验小组中的一个, 这些实验小组激发人与自然不同的心理距离。受到与自然有密切心理距离引导 (如嗅闻和触摸自然元素) 的参与者与自然的互动比其他参与者多 3-4 倍, 他们报告的积极影响也比其他参与者多 0.2 倍。我们的研究结果表明, 在自然体验中提供使人们更接近自然并潜在地诱发状态自然联结的引导, 可以提高人们的自然互作质量和受到的积极影响。以上结果强调了自然联结在高质量自然互作中的作用, 并提出引导式自然体验作为一种激发状态自然联结, 促进与生物多样性有意义的互动, 从而协调保护和人类福祉目标的方法, 具有很好的前景。**【翻译: 胡怡思; 审校: 聂永刚】**

关键词: 自然联结, 心理距离, 人与自然相融, 幸福, 自然保护区, 经历的消失, 自然经历, 引导式自然体验

Introduction

Human behavior is a key determinant of the current biodiversity crisis (Cardinale et al. 2012), and the solutions to it largely depend on changing the way people use and value nature (Reddy et al. 2017). Yet, urbanization and urban lifestyle are increasingly disconnecting the majority of the world population from the experience of nature, in a process termed "extinction of experience" (EOE) (Pyle 1978). This EOE is profoundly concerning because it diminishes the multitude of health and well-being benefits people can retrieve from experiences of nature and ultimately endangers their affinity for nature and their willingness to protect it (Miller 2005). Loss of opportunities to experience nature, caused by land-use changes, is a primary driver of EOE (Soga & Gaston 2016), which reduces the extent to which individuals directly interact with biodiversity (Cox et al. 2017*b*). Increasing opportunities to experience nature (e.g., greening cities) and encouraging people to spend more time in nature can serve as a means to tackle these issues. However, increasing the number of nature experiences (quantity) may not be enough to reduce some of the consequences of the EOE, and there is some evidence that the quality of people's nature interactions (NI) should also be considered (Lin et al. 2014; Gaston et al. 2018; Colléony & Shwartz 2019; Colléony et al. 2019). Because people's affinity for nature plays a significant role in the way they interact with nature (e.g., Lin et al. 2014), we explored avenues for increasing people's nature relatedness [NR] (i.e., affinity for nature) as means to enhance the quality of their NI and their positive affect (PA) following visits to green spaces.

NR is a sense of connectedness with the natural world (Nisbet et al. 2009) and is a stable and enduring trait of individuals that primarily develops during childhood (Chawla 1988) and evolves over time (Hughes et al. 2019) (i.e., trait NR). NR is positively related to the way people interact with nature and specifically to their experience of nature measured as the time spent in nature (Mayer et al. 2009; Lin et al. 2014). NR is also directly related to well-being (Capaldi et al. 2014), health (Shanahan et al. 2016), and conservation commitment (Chawla & Derr 2012). Thus, enhancing NR could help restore intimate relationships with nature and ensure sustainable human and wildlife communities. Although enhancing trait NR may be challenging, temporarily increasing state NR can be achieved through methods borrowed from

experimental psychology. Indeed, like other individual differences that were successfully situationally induced (e.g., mindsets [Anisman-Razin & Levontin 2020]), NR can be situationally induced, and short-term exposure to nature is enough to remind people of their NR (Mayer et al. 2009).

NR can be understood as a close psychological distance from nature. In psychology, the concept of psychological distance refers to the degree of experienced distance between the self and some other person, place, or point in time (Williams & Bargh 2008). Different dimensions of psychological distance (time, space, social distance, and probability) affect mental construals of events, and in turn these construals guide people's choices, preferences, and behaviors (Trope et al. 2007). Psychologically near objects are represented by low-level construal, in which people focus on detailed, concrete, local, and contextualized features. Conversely, psychologically distant objects are represented by high-level construal, in which people focus on abstract, central, global, and decontextualized features (Trope & Liberman 2003). High and low psychological distances can be experimentally induced. For instance, following exposure to a spatial distance stimulus (vs. a closeness stimulus), participants reported weaker emotional relatedness to their siblings, parents, and hometown (Williams & Bargh 2008). Experimentally induced cues are increasingly used to influence individuals' attitudes and behaviors toward the natural world (Byerly et al. 2018). For instance, proenvironmental cues were used to induce more environmental friendly consumer choice in a hypothetical choice task (Tate et al. 2014). We suggest the use of close (vs. far) spatial-distance cues to experience nature as a potential means to induce high (vs. low) levels of state NR and promote interactions with nature.

The quantity of NI is positively associated with personal health and well-being outcomes (Shanahan et al. 2016; Cox et al. 2017*a*) and with PA (Mayer et al. 2009). Nevertheless, the quality of NI is another important aspect of nature experience. NI are multisensory experiences that have only recently been considered in relation to the quality of nature experience and its outcomes (e.g., Clayton et al. 2017). Consistently, it has been demonstrated that merely spending more time in nature is not enough to foster concern for the natural environment and that more conscious engagement with nature is crucial (Colléony et al. 2019). Indeed, positive correlations between species diversity, vegetation cover, and well-being and health occur (Marselle et al. 2019), although these correlations vary with cultural, social, and ecological context (Colléony & Shwartz 2019). Unfortunately, when in nature, most individuals do not directly seek to interact with biodiversity (e.g., Irvine et al. 2013), and this, in turn, is likely to affect the outcomes of the experience (e.g., biodiversity knowledge [Prévot et al. 2018]). As Duval (2011) said, "the restorative potential of a setting abundant with nature may be decreased if one decides to use this environment to return neglected phone calls; likewise, the restorative potential of a more modest natural setting may be enhanced if one chooses to perform a task, such as listening to bird songs, that encourages greater engagement with the physical environment."

High-quality and meaningful NI (e.g., smelling flowers, observing wildlife) have the potential to deliver positive health and well-being benefits and to promote conservation behaviors (Rosa et al. 2018). However, the understanding of the means to improve the quality of NI remains limited. Such knowledge is urgently needed if conservationists are to mitigate the deleterious consequences of the EoE and jointly benefit individual health and well-being and biodiversity conservation. Cues to care were previously introduced as a means of changing one's perception of a landscape as culturally acceptable (Nassauer 1995). We propose the use of cues to experience (i.e., cues that guide individuals on how to interact with nature) as a means to induce state NR, by decreasing the psychological distance from nature (e.g., by smelling flowers), and to improve the quality of NI. Our objective was to understand the effect of state NR, based on cues to experience, on the quality of NI and PA. We asked how NR, the quality of NI, and PA are associated after spending time in nature. To address this question, we surveyed visitors of a nature reserve and expected to find positive relationships between these three variables. We also asked how using cues to experience nature, as a means to induce NR situationally, affects the quality of people's NI and their PA after visiting a nature reserve. To answer this question, we conducted a controlled field experiment. We expected that participants who received cues of close psychological distance from nature would interact more with nature and report higher PA than participants exposed to other cues. We also hypothesized that the relationship between cues to experience and PA is mediated by the quality of NI (Fig. 1).

Materials and Methods

Field Survey

We conducted the field survey in Ramat Hanadiv, a publicly accessible nature reserve in Israel, located in the southern part of Mt. Carmel. Ramat Hanadiv combines a memorial garden (ca. 7 ha), an intensively managed botanical garden, and a 455-ha nature park of typical natural Mediterranean vegetation (Supporting Information). We conducted a visitors' survey on 9 sunny days from 1000 to 1500 in the Spring of 2019. In total, 1023 visitors participated in our survey. The questionnaire was designed to capture respondents' NR (state and trait), the quality of their NI during their visit, and their PA

Figure 1. Theoretical model of how nature relatedness (trait NR [measured] or state NR [increased by decreasing the psychological distance to nature]) promotes the quality of nature interactions, how nature interactions are positively related to positive affect, and how nature relatedness influences positive affect through the quality of nature interactions.

following the visit, as well as sociodemographic variables. Surveys were presented in Hebrew, but English versions are in Supporting Information.

We measured trait NR with the 6-item version of the NR scale (Nisbet & Zelenski 2013). Participants rated their level of agreement with each statement on a 5-point scale, from 1, strongly disagree, to 5, strongly agree. We used a Hebrew version of the NR scale that was validated and used in a previous study in Israel (Tzunz 2017). Based on satisfactory internal consistency (Cronbach $\alpha = 0.84$), we derived a single measure of NR by averaging scores of the 6 items. Following Nisbet et al. (2019), we used the graphical measure of inclusion of nature in self (INS) (Schultz 2001) to measure a state-like NR. This scale consists of 7 pairs of overlapping circles labeled nature and self that differ in degree of overlap. Participants selected the pair of circles that represented best how interconnected they felt with the natural world, and an INS was derived, ranging from 1 (completely separated circles) to 7 (completely overlapping circles).

To measure the quality of NI (i.e., the extent to which participants interacted with nature [observe, smell, listen, touch, take pictures]), we provided a list of 37 specific NI (e.g., "Did you see a bird?" "Did you touch leaves?") and asked participants to answer yes or no for each behavior. We added to this list 6 control behaviors, not related to nature (e.g., "Did you smell car pollution?"), and 1 behavior considered as potentially harmful for nature ("Did you pick flower(s)?") to ensure participants thought about the items while answering. Some of the NI (e.g., "Did you see a bird?") were more expected than others (e.g., "Did you see a jackal?"). The NI items were presented in random order (Supporting Information). An NI score was derived for each participant by summing the number of *yes* answers participants reported (range 0 to 37).

PA was measured using the positive and negative affect state scale (PANAS), a 20-item measure of PA (10 items, e.g., "excited," "inspired" [$\alpha = 0.87$]) and negative affect (NA) (10 items, e.g., "upset," "distressed" [$\alpha = 0.83$]) (Watson et al. 1988). To increase external validity, we used a second scale to measure PA, the overall happiness state scale (Hartig et al. 2003), a thermometer-like scale ranging from 0 (not happy at all) to 10 (very happy). Finally, participants reported their gender, age, and whether they were first-time visitors. We excluded questionnaires from respondents who reported being under 18 years old and that were incomplete ($n = 59$).

Statistical analyses were performed using SPSS version 27 (IBM Corp. 2019). We determined the minimum sample size ($n = 166$) with G*power 3.1.9.4 (9 predictors, medium effect size, power 0.95). We analyzed the correlations (Pearson) between NR (state with INS and trait with NR), NI, and PA (PANAS positive and overall happiness scale) among visitors of the nature reserve. We verified that the sampling design did not bias our results (Supporting Information). Based on differences in visitor profiles and experience across sampling days (Supporting Information), we verified that demographic variables did not affect the correlations we identified using regression models (Supporting Information).

Controlled Experiment

The experiment took place at the Technion (Israel Institute of Technology) campus (132 ha) located in the northern part of the Carmel Mountain (Supporting Information). In Spring 2018, we recruited 303 participants (mean age: 25.65 [SD 3.72], female = 52.14%). Participants were compensated by either course credits or monetary payment (ca. $US8.5). Participants were randomly assigned to 1 of 9 experimental conditions. In 5 conditions, the low psychological (spatial) distance conditions, participants received closeness to nature cues (i.e., smelling flowers, touching natural elements, observing wildlife, listening to surrounding sounds, taking pictures). In 3 conditions, the high psychological distance conditions, participants received distance from nature cues (i.e., walking more slowly than usual, turning off the phone, exploring as many areas as possible). In the control condition, there were no cues related to psychological distance from nature. Participants were instructed to spend at least 30 minutes outdoors within the campus and return to the lab to complete a survey. Because the Technion Campus is situated on the Carmel slopes, we drove all participants to the highest point at the campus in the middle of the Technion forest (ca. 1 km from the lab [Supporting Information]). At the starting point, participants received instructions on paper and a GPS tracker. The general instructions (with a map of campus) were identical for all participants; the only difference was the psychological distance cues (e.g., "please look for and smell flowers") that were printed (one sentence) right after the general instructions.

Following the walk outdoors, participants arrived back to the lab and reported the quality of their NI during the walk and their current PA. We measured NI with the same scale of 45 behaviors as in the survey. PA was measured using the PANAS state scale as in the survey ($\alpha = 0.83$; NA, $\alpha = 0.85$). In addition, participants estimated the number of different areas they explored and the time they spent using their phones during the walk (continuous scale of 0–60 minutes, transformed into a binary variable 0 [no use] or 1 [use] because the data were skewed toward 0). Walking speed was estimated based on the GPS data. Finally, participants reported their trait NR based on the NR scale as in the survey ($\alpha = 0.82$) and their gender and age. The experimenter kept track of the day, time, and weather during the experiment. We did not exclude any condition or participant from the analyses.

Statistical analyses were also performed using SPSS for the mediation analysis and G*power to determine the necessary sample size ($n = 261$) (9 experimental groups, medium effect size, power 0.95). Prior to conducting our analyses, we verified that the randomized assignment of participants to groups worked adequately (Supporting Information); experimental cues worked as expected on the targeted behavior (Supporting Information); and cues we used were good indicators of psychological distance from nature or, in other words, state NR (Supporting Information). We then used analysis of variance (ANOVA) with multiple Tukey's honest significance test post-hoc comparisons to test the effect of the cues on NI (Supporting Information) and the effect of the cues on PA. To check whether our cues influenced all NI, not only the targeted behavior, we repeated the ANOVA to assess the effect of the cues on NI scores while excluding the behavior targeted by the cue. For instance, to assess the impact of the smell-flowers cue compared with others, we removed the smell behaviors from the calculation of NI score (Supporting Information). We also analyzed and compared correlations (Pearson) between NI and PA between all experimental groups (Supporting Information).

Finally, we tested our hypothesis of a causal relationship between the experimental cues and PA through NI with a multicategorical mediation model with the PROCESS procedure (Hayes & Preacher 2014). That is, in the mediation model, the effect of each experimental condition was analyzed in comparison to the control condition. Indirect effects were estimated using a nonparametric bootstrapping procedure. A bias-corrected bootstrap interval (CI) was then generated for this parameter estimate, and a CI that did not include zero indicated a significant mediation effect (Preacher & Hayes 2008). Fisher's least significant difference post-hoc tests were used to determine the respective effects of each psychological distance cue in comparison with the control group. To verify the directionality of causality of the relationships, we repeated the mediation model with PA as the mediator and NI as the outcome variable (Supporting Information).

Ethics Statement

Permission for this study was granted by the Technion Social and Behavioral Sciences Institutional Review Board (approval numbers for the survey and experiment were 2019–024 and 2018-017, respectively), and the research was performed in accordance with the board's relevant guidelines and regulations.

Results

Field Survey

Respondents' age ranged from 18 to 84 years old (mean age = 41.60 [SD 12.78]). There were slightly more men (51.65%), and most had already visited the nature reserve (72.40%). We found significant positive relationships between NR (both state and trait), NI, and PA (both PA and overall happiness) (Pearson's rho = 0.16–0.49) (Table 1).

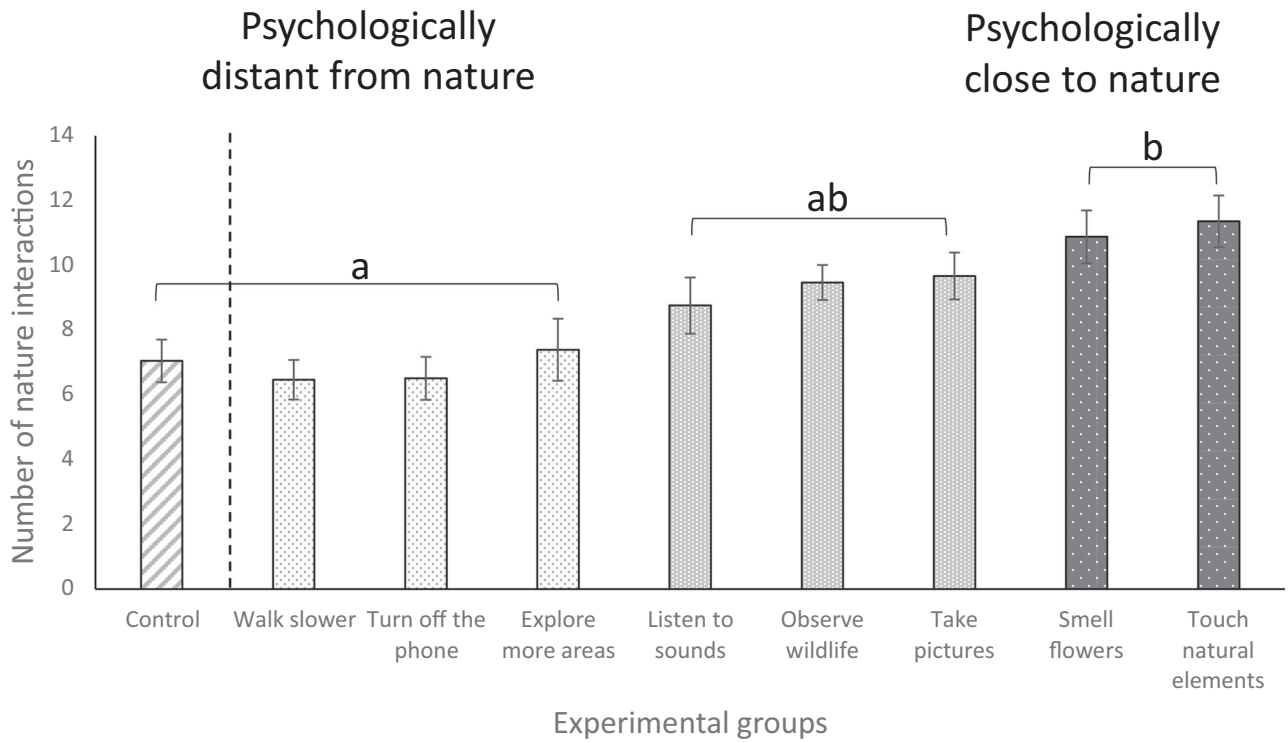

Figure 2. Mean number (SE) of nature interactions per experimental group. Main differences identified using analysis of variance and Tukey's honestly significant different post-hoc comparisons: matching letters, no difference; two different letters, differences between groups (e.g., control group's mean, letter a, is different from the mean of touch natural elements group, letter b, but is not different from the mean of listen to sounds group, letters ab).

Table 1. Correlation matrix between trait and state nature relatedness, nature interactions, overall happiness, and positive affect in a survey of visitors of Ramat Hanadiv nature reserve*.

	2	*3*	*4*	*5*
1. Trait Nature relatedness	0.49	0.31	0.27	0.47
2. State Nature relatedness		0.18	0.16	0.28
3. Nature interactions			0.19	0.31
4. Overall happiness				0.46
5. Positive affect				

**All correlations are significant ($p < 0.001$).*

These relationships remained significant when controlling for demographic variables (Supporting Information).

Controlled Experiment

We found significant differences in NI between the different experimental groups (ANOVA $F = 6.12$, df $= 8$, $p < 0.001$) (Fig. 2). Participants who received cues to smell and touch (psychologically close to nature) reported significantly higher overall NI (Fig. 2; Supporting Information). Overall, NI of participants who were instructed to walk slower, turn off their phone, explore more areas (psychologically far from nature) did not differ from those reported by control group participants, and the remaining conditions demonstrated intermediate scores (Fig. 2; Supporting Information). When we excluded for each condition the NI that related directly to the cues to experience (e.g., NIs related to smelling for the smelling condition), we found higher NI for 2 conditions: touch and smell versus all other conditions. This means participants who were asked to touch or smell had an overall quality of NI (e.g., observe, take pictures, listen) that was higher than that of other groups (Supporting Information). We did not find any difference in PA between the different experimental groups (ANOVA $F = 0.86$, df $= 8$, $p = 0.54$), and the correlation between NI and PA was only significant in the close psychological distance experimental groups (smell flowers, $r = 0.54$; touch nature, $r = 0.36$) (Supporting Information).

Multicategorical mediation analysis of the effect of the psychological distance cues on PA through NI revealed a direct effect of the cues on NI ($F = 6.12$, df $= 8$, $p < 0.001$) (Fig. 3 & Supporting Information). There were no direct effects of the cues on PA ($F = 1.00$, df $= 8$, $p = 0.43$). However, we found relative indirect effects for four of the five close psychological distance from nature cues (Fig. 3) on PA through NI. No other

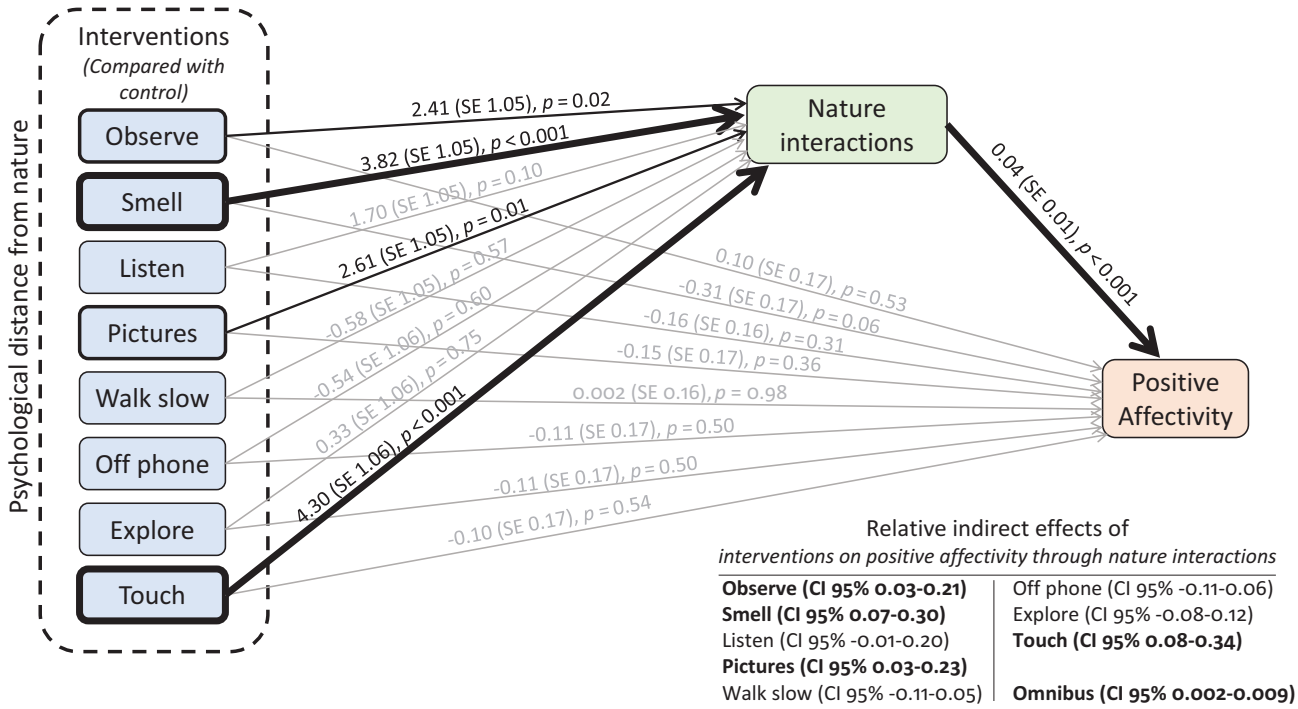

Figure 3. Results of multicategorical mediation analysis of estimates of the direct and indirect effects of 8 different experimental cues (compared with the control group) on positive affectivity through nature interactions (arrows, direct effects; grey arrows, effects with $p > 0.05$; black arrows, effects with $p < 0.05$, thickness of the black arrows, strength of the effect; bold values, relative indirect effects with a 95% CI that did not include 0).

indirect effect on PA, through NI, was found (Fig. 3). The alternative mediation model, in which PA was the mediator and NI the outcome variable, revealed similar results with one exception, there were no indirect effects of the cues on NI through PA, suggesting that NI mediates the relationship between cues and PA rather than PA mediating the relationship between cues and NI (Supporting Information).

Discussion

Nature experiences provide a wide range of psychological, physiological, and social benefits and can also influence the way people value nature and commit to protect it (Keniger et al. 2013). The EOE is, therefore, a rising concern for both humans and biodiversity conservation (Soga & Gaston 2016). Because this EOE is aggravated by a pervasive, negative cycle that reduces people's affinity for nature, providing opportunities to experience nature may be insufficient to mitigate this phenomenon, and efforts should enhance the quality of interactions with nature (Colléony et al. 2019). In the following, we suggest how this can be achieved. First, we demonstrate positive relationships between NR (both state and trait NR), the quality of people's NI, and the benefits gained from these interactions. Second, we show that by using relevant cues to experience, one can increase the quality of NI, which is positively related to PA (Fig. 1). We suggest that these cues have the potential to situationally induce NR by reducing people's psychological distance from nature. Our results bring insight into how to influence the way people interact with nature while spending time outdoors.

Previous research suggests that conscious interactions with nature are crucial for the experience to be meaningful and translate into health, well-being, and conservation benefits (Duvall 2011; Colléony et al. 2019). We found that the restorative benefits people retrieve from experiencing a natural environment positively correlated with how they interacted with the natural environment. Our survey results demonstrate that peoples' state and trait NR are related to the quality of their interactions with the natural environment and to PA. Our results are consistent with previous studies that show the importance of NR as a driver of nature experiences, especially in comparison to opportunities (e.g., Lin et al. 2014). Designing biophilic cities that encourage meaningful interactions (Beatley 2010) could therefore help improve individual well-being and biodiversity conservation. This highlights the importance of identifying the means to influence NR.

Psychology theories and methods are increasingly used in environmental research and have been highly effective in influencing people's behaviors, but they remain largely underused in conservation research (Byerly

et al. 2018). Applying such theories and methods to conservation research can be useful for bringing people closer to nature and complement efforts to help mitigate the consequences of EOE. Nisbet et al. (2019) previously demonstrated that a 20-minute guided intervention of mindful awareness of nature induces state NR and boosts mood. In this study, we designed cues aimed at reducing the psychological distance from nature (i.e., inducing state NR) and experimentally showed their causal effect on the quality of NI. The effects of touching and smelling cues were particularly high compared with the other 2, and their effect persisted even after we compared nature interaction scores with touch and smell behaviors excluded (Supporting Information). Indeed, an object has to be within one's reach to be touched, it may be farther away to be smelled, and it can still be farther away to be heard or seen (Trope & Liberman 2010). Unlike a 20-minute guided intervention of mindful awareness of nature (Nisbet et al. 2019), short messages such as our cues to experience can easily be used with a broad audience or in different contexts. This raises the potential for the use of low-cost and high-benefit tools to promote meaningful interactions with nature and potentially even improve individual well-being.

Limitations and Future Research

Although our proposed causal model is grounded in theory and supported by analyses, our experimental design does not set a causal chain between NI and PA because those variables were both assessed after the walk. Another limitation of our study is that we did not directly confirm that our experimental cues induced state NR. Although our post-test survey provided support for this, future studies could investigate this further by including a measure of state NR (e.g., INS). Although we acknowledge these limitations and call for caution with any generalization of our results, our study suggests a promising avenue for enhancing affinity for nature and meaningful interactions with nature. More research effort is now needed to test the causal chain of events experimentally. For instance, measuring NI and PA at two separate times or monitoring change in affect after the walk compared with before could help establish causality. Moreover, our study relied on self-reports of NI and PA, which may be subject to self-desirability biases. Using additional independent measures for NI (e.g., behavioral observations that could potentially monitor unconscious NI) or well-being (e.g., physiological sensors) can help overcome this limitation. Although we built a measure of the quality of NI for a specific context (natural areas in Israel), our measure can be easily adapted to other contexts, and we believe it is a stepping stone for the development of further indicators of human interactions with nature (e.g., more sophisticated versions of our yes-no tool). Finally, future studies should replicate our work while exploring short-term outcomes for conservation, for instance, explore whether the willingness to pay for species conservation programs differs among experimental conditions.

Conservation Implications

Our results can be applied to landscape planning and conservation management. We suggest that efforts be made not only to increase opportunities to experience nature in cities, but also to reduce people's psychological distance from nature. This can already be achieved by using adequate landscape design strategies, for instance, by planting flowers at hip or chest height (e.g., in elevated pots or on green walls) instead of at ground level. Planting aromatic or other edible plants in public spaces will provide people more opportunities to smell or taste natural elements (Fischer & Kowarik 2020). Touch and smell produce detailed, long-lasting memories (Willander & Larsson 2006; Hutmacher & Kuhbandner 2018), which suggests that cues to experience targeting these senses may be particularly valuable for children when building their emotional connection with the natural world (Chawla 1988).

Beyond landscape planning, our work showed the usefulness of designing and implementing cues to experience to bring people closer to nature. Although we used messages as cues in our study, other methods such as signs can be used to deliver these cues to individuals, for example, through priming (subtle stimulus leading to a change in behavior). Some of the messages are already implemented in many nature reserves and green spaces. However, field experiments that test these interventions remain scarce in conservation psychology, and there is now a crucial need to go beyond observation approaches and experimentally test the effectiveness of different interventions on outcomes, such as interactions with nature, well-being, and NR. Furthermore, urban or national parks often have entrance signs listing several bans, thus, reminding the public to keep distant from natural elements. In our study, the turn-off-the-phone message was the only one in the do-not format, and it had a negative effect on participants' NI. We, therefore, argue that prohibiting behaviors may be counterproductive while promoting NI that visitors may not even be aware are possible would be much more valuable. This result also suggests that banning technologies may not be an adequate solution for the EOE problem, but rather that technology should be used as means to increase people's involvement and interest while in nature (e.g., taking pictures, sharing them on social media, using species identification apps) (Clayton et al. 2017).

Although beneficial for PA, promoting NI can come at some cost for biodiversity. We checked in our experiment whether people increasingly picked flowers, and we found evidence that those who were asked to smell

and touch picked more flowers than other participants ($\chi^2 = 21.58$, df = 8, $p = 0.005$). However, a recent study of urban foraging (gathering wild plants in cities) found that neither native nor rare species were overforaged (Fischer & Kowarik 2020), suggesting that the cost of promoting interactions is lower than the benefit, at least in urban areas. Disturbance can take other forms, such as increased trampling on flower beds or disturbing wildlife by more actively looking for it, and we acknowledge the potential downside effects of increasing NI for conservation. We thus need to make sure that interventions used as cues promote behaviors that are the least harmful to biodiversity, especially in those areas that are designated for nature conservation. There is a sharp debate on the trade-offs that occur between ensuring individual and societal well-being and conserving biodiversity (e.g., Adams et al. 2004). It is, therefore, important to carefully identify the right balance between encouraging NI and conserving biodiversity. One way to achieve this is to increase NI in specific areas to spatially limit the potentially deleterious effects of increasing those behaviors on biodiversity while providing people with meaningful experiences of nature. Finally, promoting explicit attention to, and interactions with biodiversity could increase people's affinity for more ecologically complex greenspaces and ultimately reconcile conservation and well-being objectives (Clayton et al. 2017).

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Supporting Information

Pictures and a map of the nature reserve, where the field survey was conducted (Appendix S1), details survey methods (Appendix S2), results of the verification analysis for the survey (Appendix S3), results of the alternative analysis for the survey (Appendix S4), pictures and a map of the campus, where the controlled experiment was conducted (Appendix S5), details on the experiment methods (Appendix S6), results of the verification analyses for the experiment (Appendices S7, S8 and S9), results of alternative analyses for the experiment (Appendices S10- S12), results of the alternative mediation analysis for the experiment (Appendix S13), results associated with the main-mediation analysis for the experiment (Appendix S14), and English versions of the questionnaires (Appendices S15 and S16) are available online. The authors are solely responsible for the content and functionality of these materials. Queries (other than absence of the material) should be directed to the corresponding author.

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