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**Nature Nurtures Authenticity: Mechanisms and Consequences**

Ying Yang1,2, Constantine Sedikides3, Yuqi Wang4,Huajian Cai1,2\*

1 CAS Key Laboratory of Behavioral Science, Institute of Psychology, China

2 Department of Psychology, University of Chinese Academy of Sciences, China

3 School of Psychology, University of Southampton, United Kingdom

4 School of Business Administration, Zhejiang Gongshang University, China

**Author Note**

Corresponding Author: Huajian Cai, Institute of Psychology, Chinese Academy of Sciences, Lincui Road, 16 Haoyuan, Beijing, China, 100101; Email: [caihj@psych.ac.cn](mailto:caihj@psych.ac.cn)

**Open Science Practice**

Data and code for all studies as well as supplementary materials are available at the Open Science Framework (OSF; https://osf.io/2wnfx/).

**Statement of Ethics**

This research was approved by the Ethics Committee of Institute of Psychology, Chinese Academy of Sciences.

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None.

## Abstract

Contact with nature may benefit, not only the bodily organism, but also the psychological self. We proposed that, assuming humans’ innate affinity for nature (the biophilia hypothesis), nature would be conducive to a sense of environment-self fit, which would be experienced as authenticity (being aligned with one’s true self). We formulated several hypotheses: (1) Nature fosters authenticity, and it does so through at least four plausible mechanisms: self-esteem, basic needs satisfaction (autonomy, competence, relatedness), mindfulness, and positive affect; (2) Self-esteem is the strongest mechanism overall, and autonomy the strongest mechanism of the three basic needs; (3) Self-esteem and authenticity mediate sequentially the positive impact of nature on current psychological wellbeing (higher life satisfaction and meaning in life); and (4) Authenticity mediates the positive influence of nature on longer-term psychological wellbeing (higher life satisfaction and meaning in life; lower depression, anxiety, and stress). We obtained support for these hypotheses across 12 studies (*N* = 5512). These were diverse in terms of setting (field, laboratory), designs (cross-sectional, experimental, longitudinal), methodology (varying manipulations of nature and assessment of mediators and/or dependent measures), and sampling (university/community, East Asian/Western). The findings establish nature as a correlate and determinant of authenticity, chiefly via the mechanism of self-esteem, and further establish authenticity (preceded by self-esteem) as a mediator of the positive influence of nature on psychological wellbeing. The findings are also generative and have policy implications.

*Keywords*:nature, authenticity, autonomy need satisfaction, positive affect, self-esteem, mindfulness, psychological wellbeing

**Nature Nurtures Authenticity: Mechanisms and Consequences**

The moon is bright and quiet flows the creek,

The rain stopped and the bamboos look fresh.

Whereby I feel like my true self,

Sitting peacefully and relaxingly.

—Yuyi Chen, Chinese poet (1090–1138)

“We often forget that we are nature. Nature is not something separate from us. So when we say that we have lost our connection to nature, we’ve lost our connection to ourselves.”

–Andy Goldsworthy (b 1956), English sculptor, photographer, and environmentalist

Nature, as Yuyi Chen and Andy Goldsworthy contended, fosters a sense of connection with one’s true self, namely, authenticity. Here, we tested this contention. We also asked how nature might increase authenticity and what the downstream consequences of this effect are.

**Nature and Authenticity**

***Definition of Nature***

Nature encompasses “elements and phenomena of Earth’s lands, waters, and biodiversity, across spatial scales and degrees of human influence, from a potted plant or a small urban creek or park to expansive, ‘pristine’ wilderness with its dynamics of fire, weather, geology, and other forces” (Bratman et al., 2019, p. 2). For the purposes of our research, we further qualify this definition as follows. Nature primarily refers to non-threatening natural settings subject to human management (e.g., urban parks; Baxter & Pelletier, 2019; Maller et al., 2008), immersion in or exposure to such settings, and activities such as plant cultivation (Tam, 2013; Zylstra et al., 2014).

***Definition of Authenticity***

A humanistic tradition, capitalizing on such constructs as self-actualization (Maslow, 1971) and the fully functioning person (Rogers, 1961), considers authenticity a disposition toward behavior congruent with the self or as “… the reduction of phoniness toward the zero point” (Maslow, p. 183). In particular, authenticity has been defined as “the unobstructed operation of one’s true self in one’s daily enterprise” (Goldman & Kernis, 2002, p. 293). It is thought to comprise four facets (Kernis & Goldman, 2006): (1) awareness of one’s motives, feelings, and beliefs, even if contradictory; (2) unbiased processing of unfavorable information about the self; (3) behavior in accord with one’s values, preferences, and needs rather than others’ expectations; and (4) relational orientation toward openness and trustfulness. These facets are assessed by the Authenticity Inventory (Kernis & Goldman).

The Authentic Personality Model condenses the above four facets into three, emphasizing the first and third facet (Wood et al., 2008). In particular, the model conceptualizes authenticity in terms of (1) authentic living (acting in alignment with one’s beliefs, preferences, values, or goals), (2) low acceptance of external influence (resisting conformity to others’ expectations), and (3) low self-alienation (maintaining one’s true self in part by rejecting external influence). These three facets are assessed by the Authenticity Scale (Wood et al.).

The above two definitions were born out of a personality trait tradition. Authenticity, though, can also be conceived at the state level, defined as a sense of alignment with one’s true self or as feeling that one is currently their real, essential self (Lenton, Bruder et al., 2013). The emphasis on felt authenticity reflects recent empirical advances (Chen, 2019; Landa & English, 2022; Rivera et al., 2019; Schmader & Sedikides, 2018; Sedikides et al., 2017; [Vess](https://journals.sagepub.com/doi/full/10.1177/1089268019829471) et al., 2019). For example, authenticity is frequent in daily life, and more frequent than inauthenticity (Huber et al., 2022).

***On the Relation Between Nature and Authenticity***

Goffman (1949) distinguished between the front-stage and the back-stage self. The front-stage self is aware of being perceived and evaluated by others. As such, it is often constrained or inhibited, and can be performative or chameleon-like. In contrast, the back-stage self is away from the public eye, is relatively free of obligation, and is unencumbered or unfiltered. The front-stage versus back-stage self metaphor has been used in descriptions of inauthenticity and authenticity, respectively (Lehman et al., 2019; Schlegel et al., 2011).

We propose that nature reinforces the back-stage self. According to the State Authenticity as Fit to Environment (SAFE) model (Schmader & Sedikides, 2018), people are attracted to and remain in spaces where they experience fit between the environment and the self. Fit is felt as authenticity. In all, nature affords satisfactory fit. But why would nature do so? According to the biophilia hypothesis, humans share an innate affinity with nature (Kellert & Wilson, 1995; Ulrich, 1993; Ulrich et al., 1991; Wilson, 1984). This affinity is due to the evolutionary adaptation to green, savanna-like environments that provided refuge, water resources, and cues for sustenance and safety (Falk & Balling, 2010; Lohr, 2007; Orians & Heerwagen, 1992). Natural environments contain aesthetic characteristics (e.g., coherence, surface texture, depth, density) that are preferred by humans both psychologically (entailing optimal arousal) and functionally (being suitable for survival; Falk & Balling, 2010; Grahn & Stigsdotter, 2010; Jiang et al., 2015; Ulrich, 1977). People even have anthropocentric biases in their nature-related teleological thinking, endorsing such statements as “Trees produce oxygen so that humans can breathe” (Preston & Shin, 2021). Of course, socialization is also relevant, as preference for nature is modulated by familiarity with natural environments (Hartmann & Apaolaza-Ibanez, 2010; Meidenbauer et al., 2019).

Suggestive evidence for nature-person fit is provided by qualitative research. For example, individuals exposed to nature (e.g., through walks in the woods) report that nature brought them closer to their inner world, emotions, or essence, and enabled them to be themselves (Meuwese et al., 2021; Revell & McCloud, 2017; Sonntag-Öström et al., 2015). Consequently, we hypothesize that nature is associated with, or fosters, authenticity.

**How Is Nature Related to Authenticity?**

But how might nature foster authenticity? We discuss four plausible mechanisms: basic psychological needs, positive affect, self-esteem, and mindfulness. We also adopt a regulatory perspective on nature exposure (Bratman, Daily et al., 2015; Korpela et al., 2020; Richardson, 2019). In particular, we argue that nature influences authenticity by regulating basic psychological needs, positive affect, self-esteem, and mindfulness. The mechanisms are congruent with three theoretical formulations derived from the biophilia hypothesis. First, according to attention restoration theory (Kaplan & Kaplan, 1989), the brain’s capacity to focus on a specific task or stimulus is limited, resulting in concentration fatigue; nature (vs. urban) exposure restores concentration. Second, according to stress recovery theory (Ulrich et al., 1991), nature (vs. urban) exposure alleviates stress. Third, according to the perceptual fluency account (Joye & van den Berg, 2011), attention restoration and stress reduction are by-products of the ease of processing of natural stimuli. Taken together, these formulations posit that non-threatening natural environments can or repair or invigorate cognitive and psychological functioning.

***Benefits of Nature***

Exposure to nature or involvement with nature is likely associated with a perceptually conveyed and assimilated sense of freedom. Natural (compared to urban) environments have more degrees of freedom or Gibsonian affordances of possible avenues of movement (Gibson, 1979). In feeling freer, one feels more self-determined. Indeed, exposure to nature or involvement with nature facilitates the basic psychological needs postulated by self-determination theory (Ryan & Deci, 2017). These needs are autonomy (i.e., self-determined action), competence (i.e., effectiveness and mastery), and relatedness (i.e., social connection; Landon et al., 2021; Quested et al., 2018; Yang et al., 2022). For example, in a series of experiments, participants recalled an experience of ostracism (vs. inclusion) or experienced ostracism (vs. inclusion). Subsequently, they were presented with photographs of natural versus urban landscapes. Participants who viewed nature scenes reported greater need satisfaction than those who viewed urban scenes (Yang et al., 2021). Stated otherwise, exposure to nature safeguarded need satisfaction (cf. Kaplan, 1995).

Exposure to nature or involvement with it may also be linked to, or raise, positive affect. As mentioned above (i.e., biophilia hypothesis; Ulrich et al., 1991; Wilson, 1984), the evolutionarily-derived affinity with nature conduces to safety (Lohr, 2007; Orians & Heerwagen, 1992) and aesthetic pleasantness (Falk & Balling, 2010; Ulrich, 1977). Further, fluent processing of natural stimuli is likely to engender positive affect, as per the perceptual fluency account (Joye & van den Berg, 2011). Indeed, exposure to nature increases positive affect (and decreases negative affect) compared to control conditions (for a meta-analysis, see: McMahan & Estes, 2015). Also, exposure to nature restores positive affect: Ostracized participants reported higher positive affect than non-ostracized participants after nature exposure (Yang et al., 2021; cf. Kaplan, 1995). In addition, nature connectedness, a trait-like construct capturing individual differences in the sense of being bonded with nature, is associated with positive affect (Capaldi et al., 2014).

Moreover, exposure to nature or involvement with it may be related to, or increase, self-esteem. Nature is non-judgmental and non-evaluative; indeed, spending time in nature is associated with a reduction in public self-awareness (Mayer et al., 2009). As such, exposure to nature may allow the individual to bring to the fore positive aspects of the self or feel good about themselves. Qualitative work has indeed linked nature involvement to higher self-esteem (Oh et al., 2020), and nature connectedness is positively related to self-esteem (Di Fabio et al., 2019). Also, engagement with nature (i.e., allotment gardening) is associated with higher body esteem (Swami et al., 2020; Swami, Barron, Hari, et al., 2019), an effect mediated by nature connectedness (Swami, Barron, Todd, et al., 2019; Swami et al., 2016). Moreover, exposure to nature contributes to self-esteem restoration following ostracism (Yang et al., 2021; cf. Kaplan, 1995).

A fourth benefit is mindfulness, the intentional and nonjudgmental awareness of the present (Kabat- Zinn, 2003). Natural environments, by being calming and varied, may invite full absorption and engagement. Qualitative work has associated nature with higher mindfulness (Brymer et al., 2020; Macaulay et al., 2022), and correlational research has demonstrated a positive link between nature connectedness with mindfulness (Schutte & Malouff, 2018; Tohme & Joseph, 2020). Further, engagement with nature increases mindfulness. For example, participants who spent at least 30 minutes a day in nature for 30 days reported greater mindfulness compared to those who were on a waiting list (Hamann & Ivtzan, 2016; see also Bratman, Hamilton et al., 2015; Lopes et al., 2020). Lastly, a qualitative investigation suggested that nature might contribute to healing from a traumatic experience through mindfulness (Moore & Van Vliet, 2022; cf. Kaplan, 1995).

***Correlates of Authenticity***

The benefits of nature involvement are also correlates of authenticity. To begin, basic need satisfaction is associated with authenticity (Lenton, Bruder et al., 2013; Thomaes et al., 2017; Wickham et al., 2018) across cultures (i.e., China, India, Singapore, U.S.; Slabu et al., 2014) and in daily reports (Heppner et al., 2008). Satisfaction of all three needs facilitates goal internalization, which is presumably a precondition for authenticity (Sheldon & Elliot, 1998).

Moreover, increased positive affect or decreased negative effect are linked with authenticity (Goldman & Kernis, 2002; Lenton et al., 2016; Lenton, Bruder et al., 2013; Rivera et al., 2019; Stephan et al., 2012; Wood et al., 2008) across cultures (i.e., China, India, Singapore, U.S.; Slabu et al., 2014) and in daily life (Heppner et al., 2008). In an experience sampling study, participants completed eight surveys per day for one week. Positive affect predicted authenticity, and participants felt more authentic in situations that they characterized as more pleasant (Cooper et al., 2018). In other experience sampling studies, higher positive (and lower negative) affect predicted authenticity (Fleeson & Wilt, 2010). Finally, in experiments, positive (vs. negative or neutral) affect increased authenticity (Lenton, Slabu et al., 2013). True-self (compared to false-self) situations entail a more positive emotional atmosphere (Rice & Pasupathi, 2010; Turner & Billings, 1991).

Self-esteem is associated with higher authenticity (Goldman & Kernis, 2002; Lenton et al., 2016; Lenton, Bruder et al., 2013; Rivera et al., 2019; Wood et al., 2008) across cultures (i.e., China, India, Japan, Singapore, U.S.; Ito & Kodama, 2007; Slabu et al., 2014). In addition, self-esteem is positively related to authenticity in daily reports (Heppner et al., 2008). Lastly, various proxies for self-esteem are positively linked to authenticity. For example, behavioral positivity (Jongman-Sereno & Leary, 2016; Smallenbroek et al., 2017) and self-appraisals on positive or socially desirable traits (i.e., agreeable, conscientious, emotionally stable, extraverted, open; Fleeson & Wilt, 2010; Sheldon et al., 1997) predict authenticity. Acceptance and approval are characteristics of authentic-self situations (Turner & Billings, 1991).

Relaxation and flow (Lenton et al., 2016; Lenton, Bruder et al., 2013) have been linked with authenticity, whereas daydreaming and mind-wandering have been lined with inauthenticity (Vess et al., 2016, 2019; Williams & Vess, 2016). More directly relevant, mindfulness is positively related to authenticity (Allan et al., 2015; Bayır-Toper et al., 2022;Kernis & Goldman, 2006; Lakey et al., 2008; Leroy et al., 2013; Tsur et al., 2016) and practicing mindfulness raises authenticity (Leroy et al., 2013; Nübold et al., 2020; Ye et al., 2019). Low evaluation apprehension or anxiety are considered characteristics of real-self situations (Harter, 2002).

***Hypotheses***

We discussed nature-derived benefits, and showed that these benefits also reflect correlates of authenticity. On the basis of the literature, we infer that basic psychological needs, positive affect, self-esteem, and mindfulness are plausible mechanisms through which nature influences authenticity. We hypothesize that these four variables will mediate the effect (correlational or causal) of nature on authenticity.

We derived two more nuanced hypotheses. The first one concerned the relative strength of the three basic needs to act as mediators of the relation between nature and authenticity. We hypothesized that autonomy would be the most potent mediator. As stated previously, natural environments often entail a sense of freedom, which is key constituent of autonomy. In addition, literature links autonomy (more strongly than relatedness or competence) to authenticity. In fact, classic treatises of authenticity de-emphasize the role of relatedness and are even adversarial to it (Kernis & Goldman, 2006; Maslow, 1968; Rogers, 1961), arguing that the authentic person resists social influence and has the courage to stand against others or societal institutions (Kierkegaard, 1844; May, 1953; Sartre, 1946). According to cognitive evaluation theory (Ryan & Deci, 2000), satisfaction of the needs for autonomy and competence, but not relatedness, should predict authenticity. Also, despite correlational evidence of an association between relatedness need satisfaction and authenticity (Lenton, Bruder et al., 2013), evidence for a causal effect of relatedness need satisfaction on authenticity is lacking (Thomaes et al., 2017, Study 3), as is evidence for a casual effect of competence need satisfaction on authenticity (Thomaes et al., 2017, Study 3). Further, recent theorizing and findings point to the role of autonomy need satisfaction in authenticity (Ryan & Ryan, 2019). As a case in point, promotion focus is positively associated with authenticity (Kim et al., 2019). Promotion focus is a self-regulatory orientation that fulfils the need for growth (Higgins, 1998), and is closely linked to autonomy (Komissarouk & Nadler, 2014). Importantly, experimentally satisfying the need for autonomy increases authenticity (Thomaes et al., 2017, Study 3).

The second hypothesis concerned the relative strength of the four putative mediators (i.e., self-esteem, autonomy need satisfaction, mindfulness, positive affect). We hypothesized that self-esteem would be the most potent mediator. Self-esteem is consequential in many domains of life (e.g., personal goals, school work, mental and physical health, antisocial behavior; Gebauer et al., 2015; Heimpel et al., 2006; [Orth](https://pubmed.ncbi.nlm.nih.gov/?term=Orth+U&cauthor_id=35357851) & Robins, 2022; Sedikides & Gregg, 2003; Swann et al., 2007). As argued in a prior section, the non-judgmental or non-evaluative character of nature likely conduces to or increases self-esteem. To the contrary, the demands of urban environments, labeled “technique” (i.e., focusing on efficiency, pressure, and deindividuation; Ellul, 1964) or “self-alienation” (e.g., lacking ownership of valued goods and services produced by the self; Marx, 1964), are likely associated with lower self-esteem or decrease self-esteem. Indeed, self-esteem has emerged as an influential antecedent of authenticity (Goldman & Kernis, 2002; Ito & Kodama, 2007; Sedikides et al., 2017, 2019). Adults construe the good and moral self as authentic (Newman et al., 2014; Schlegel et al., 2009; Strohminger et al., 2017), and children believe that their positive traits reflect their authentic selves more so than their negative traits (Harter, 2002). Also, self-positivity, in the form of being self-compassionate (Zhang et al., 2019), upholding personal values (Smallenbroek et al., 2017), or behaving morally (Christy et al., 2016) raises authenticity. Similarly, self-enhancement, that is, receiving favorable (vs. unfavorable) feedback on personally important attributes, or imagining a future occasion in which one would manifest much higher (vs. much lower) caring, understanding, or kindness than they had now, raises authenticity (Guenther et al., 2023).

**Nature, Authenticity, and Psychological Wellbeing**

We wondered additionally about the downstream consequences of nature-related or nature-induced authenticity. According to several theoretical formulations, nature involvement is related to, or increases, psychological wellbeing (PWB). These formulations, derived from the biophilia hypothesis, emphasize effective coping or decreased stress (Evans & Cohen, 1987; Bratman, Hamilton, & Daily, 2012; Korpela et al., 2018). In line with this theorizing, we defined PWB both as advancing positive outcomes (operationalized in terms of life satisfaction and meaning in life) and buffering against harm (operationalized in terms of depression, anxiety, and stress). Nature involvement is indeed related to PWB, including higher life satisfaction (Capaldi et al., 2014; Mayer & Frantz, 2004; Tam, 2013; Yang et al., 2022) and meaning in life (Di Fabio et al., 2019; Nisbet & Zelenski, 2013; Passmore & Holder, 2017; Pensini et al., 2016; Yang et al., 2022), as well as lower depression ([Beute](https://www.sciencedirect.com/science/article/pii/S1353829217301004" \l "!) & de Kort, 2018; [Jakstis](https://sciprofiles.com/profile/1731810) & Fischer, 2021; [Tran](https://www.sciencedirect.com/science/article/pii/S266717432200009X#!) et al., 2022; Turunen et al., 2023), anxiety ([Braçe](https://sciprofiles.com/profile/author/RkdIay9YV2R2Ti85QTBuU0JTNWU3dz09) et al., 2020; Farrow & Washburn, 2019; Gascon et al., 2018; Turunen et al., 2023), and stress (Bakir-Demir et al., 2021; Cindrich et al., 2021; [Mintz](https://www.sciencedirect.com/science/article/pii/S0272494421001675" \l "!) et al., 2021). We expected to replicate these findings.

The literature has established that authenticity is also related to PWB, including higher life satisfaction (Chew & Ang, 2021; Goldman & Kernis, 2002; Kifer et al., 2013; Riggle et al., 2017; Thomaes et al., 2017) and meaning in life (Rivera et al., 2019; Schlegel et al., 2009, 2011), as well as lower depression (Bryan et al., 2017; Riggle et al., 2017; Thomaes et al., 2017), anxiety (Asher & Aderka, 2021; Bryan et al., 2017; Thomaes et al., 2017), and stress ([Grieve](https://www.liebertpub.com/doi/abs/10.1089/cyber.2016.0010) & Watkinson, 2016;Riggle et al., 2017; Wood et al., 2008). We expected to replicate these findings. More important, we hypothesized that authenticity—preceded by self-esteem or alone—would transmit the (correlational or causal) effect of nature on PWB.

**Overview**

We hypothesized that nature involvement fosters authenticity, and plausibly does so through at least four independent mechanisms: basic psychological needs, positive affect, self-esteem, and mindfulness. We further hypothesized that autonomy is the most impactful mechanism among basic psychological needs, and that self-esteem is the most impactful mechanism among them all. Finally, we hypothesized that authenticity mediates the relation between nature and PWB.

We tested these hypotheses in 12 studies. They were diverse in terms of methodology (e.g., differing manipulations of nature and assessment of putative mediators or dependent measures), participants (mostly university students but also community members), and cultures (mostly East-Asian [i.e., Chinese] but also Western). In Studies 1–2, we examined the cross-sectional link between nature involvement and authenticity. In Studies 3–6, we tested experimentally whether nature involvement augments authenticity via, respectively, basic need (especially autonomy) satisfaction, positive affect, self-esteem, and mindfulness. In Study 7, we tested: whether nature connectedness positively predicts autonomy satisfaction, positive affect, mindfulness, self-esteem, and authenticity; whether the association between nature connectedness and authenticity is independently mediated by those four variables; and whether self-esteem is the most powerful mediator. In Studies 8–9, we examined whether the Study 7 findings were replicated experimentally. In Study 10, we tested directly the mediational character of self-esteem. Following the logic of the experimental-causal-chain approach (Spencer et al., 2005), we manipulated self-esteem and measured authenticity. In Study 11, we examined the impact of nature, via self-esteem and authenticity, on current PWB (life satisfaction, meaning in life). Finally, in Study 12, we examined the downstream consequences of nature-induced authenticity for PWB (life satisfaction, meaning in life, depression, anxiety, stress).

We tested community members in Studies 1–2, and 9–11, and undergraduate students in the rest of them. Further, we tested Chinese participants in all studies but Study 9, where we tested Western participants. Across studies, participants learned that they were taking part in research on “environmental perception.” When a scale was unavailable in Chinese, we first translated it by committee (Brislin, 1980), and then followed translation and back-translation procedures.

All studies were approved by the Institutional Review Board of the first author’s institution. We report how we determined our sample size, all manipulations, and all measures (no data exclusions), and we follow Journal Article Reporting Standards (Kazak, 2018). Supplementary Materials, data, and analysis code for all studies are available on the OSF (https://osf.io/2wnfx/), and the research protocol in Supplementary Materials. We preregistered four of the 12 studies: Study 3 ([https://osf.io/wvk4a/)](https://osf.io/wvk4a)), Study 9 (https://osf.io/2gbd6/), Study 10 (https://osf.io/wtgk7/), and Study 11 (https://osf.io/4b687/).

**Study 1: Correlational Evidence for the Relation Between Nature and Authenticity**

In online cross-sectional Study 1, we conducted a preliminary test of the hypothesis that nature is beneficial for authenticity. The hypothesis anticipates that greater nature involvement is associated with higher trait authenticity. We operationalized nature involvement as both nature connectedness and engagement in nature-related activity (i.e., cultivating indoor plants).

**Participants**

We opportunistically recruited 1,179 participants (694 women, 485 men) from Wenjuanxing, a popular Chinese online platform similar to Qualtrics[[1]](#footnote-1). Their ages ranged from 18 to 66 years (*M* = 33.96, *SD* = 9.20; 22 participants did not report age). We remunerated each with 2 Yuan (≈ $.30).

**Measures**

We assessed nature connectedness with the 14-item Connectedness to Nature Scale (Mayer & Frantz, 2004; for the Chinese version, see: Geng et al., 2015). A sample item is “I often feel a sense of oneness with the natural world around me” (1 *= strongly disagree*, 7 *= strongly agree*; *M* = 4.77, *SD* = .85, ɑ = .82). We assessed engagement in nature-related activity by asking participants whether they cultivated indoor plants (yes vs. no). Next, we assessed authenticity with the 12-item Authenticity Scale (Wood et al., 2008; for the Chinese version, see Slabu et al., 2014). A sample item is: “I am true to myself in most situations” (1 = *does not describe me at all*,7 = *describes me very well*; *M* = 4.43, *SD* = .91, ɑ = .84). Finally (here and in all studies), participants responded to demographic questions[[2]](#footnote-2).

**Results and Discussion**

Nature connectedness was positively related to authenticity, *r*(1179) = .32, *p* < .001. Similarly, participants high on engagement in nature-related activity (i.e., those who cultivated indoor plants; *M* = 4.48, *SD* = .89) reported feeling more authentic than participants low on engagement in nature-related activity (i.e., those who did not cultivate indoor plants; *M* = 4.29, *SD* = .95), *t*(1177) = 3.07, *p* = .002, Cohen’s *d* = .21, 95% CI [.08, 35][[3]](#footnote-3). As hypothesized, nature involvement was related to higher trait authenticity.

**Study 2: A Field Quasi-Experiment on the Role of Nature in Authenticity**

In Study 2, a field quasi-experiment, we again evaluated the hypothesis that nature is beneficial to authenticity. We surveyed individuals either at natural environments (i.e., parks) or urban settings (i.e., plazas). We expected for participants in natural environments to report higher state authenticity than those in urban settings.

**Participants**

Study 2 allows the ecological assessment of the association between natural (vs. urban) environments and authenticity. We determined the sample size after Schönbrodt and Perugini (2013), who found that at least 250 participants are needed to obtain a stable correlation. (We conservatively treated this quasi-experiment as a cross-sectional study.) We surveyed 270 Chinese participants, compensating them with 5 Yuan (≈ $.80). The sample included 135 women and 135 men, who ranged in age from 13 to 68 years (*M* = 27.57, *SD* = 11.00). We conducted the survey in two parks (nature condition; *n* = 133) and two plazas (urban condition; *n* = 137), sample photographs of which we display in Figure 1.

**Figure 1**

*Sample Photographs of Testing Sites (i.e., Park and Plaza) in Study 2*



**Procedure**

Four female research assistants (unaware of hypotheses) carried out the survey on the same day in the month of April, two in each site (determined by random assignment). The research assistants approached 221 individuals in the nature condition, 88 (39.82%) of whom declined, and 234 individuals in the urban condition, 97 (41.45%) of whom declined. The attrition rate did not differ significantly across conditions, χ2(1, 455) = .126, *p* = .775. We assessed authenticity with the state version the Authenticity Scale (Lenton, Slabu et al., 2013; for the Chinese Version, see: Slabu et al., 2014). A sample item is: “Right now, I am true to myself” (1 = *strongly disagree*, 7 = *strongly agree*; *M* = 4.41, *SD* = .82; ɑ = .75).

**Results and Discussion**

Participants in the nature condition (*M* = 4.54, *SD* = .82) reported being more authentic than those in the urban condition (*M* = 4.28, *SD* = .81), *t*(268) = 2.69, *p* = .008, Cohen’s *d* = .33, 95% CI [.09, .57]. As hypothesized, presence in a natural (than urban) environment was linked to higher state authenticity. Given the quasi-experimental character of this study, though, causality is ambiguous: it is likely that individuals higher in authenticity gravitate toward parks than malls. We addressed the issue of causality in the next study.

**Study 3: Experimental Evidence for the Nature-Authenticity Link and Its Mediation**

**by Basic Psychological Needs (Especially Autonomy Satisfaction)**

In preregistered field experimental Study 3, we tested directly the hypothesis that nature is beneficial for (state) authenticity. Also, we tested the hypothesis that nature would increase satisfaction of all three basic psychological needs (autonomy, competence, relatedness), although, in a recent laboratory experiment, Yang et al. (2022, Study 2a) reported a null effect of nature on relatedness. More important, we examined the mediational role of need satisfaction. We evaluated the hypothesis that, although nature’s effect on state authenticity would be independently mediated by satisfaction of all three basic needs, autonomy satisfaction would emerge as the stronger mediator in a parallel mediation analysis.

**Participants**

We used the Monte Carlo Power Analysis for Indirect Effects application (Schoemann et al., 2017) to determine the sample size for the proposed mediation model with three parallel mediators (i.e., satisfaction of autonomy, competence, relatedness). As the nature effect on state authenticity is medium (based on Study 2), we assumed medium intercorrelations among the manipulation (nature vs. urban condition), mediator, and dependent variable (authenticity) of *r* = .30 (*SD* = .10). Accordingly, we needed at least 291 participants to reach power .80 at α = .05. We tested 322 Chinese undergraduate students (204 women, 118 men) at [MASKED] University in exchange for course credit. They ranged in age from 18 to 24 years (*M* = 18.74, *SD* = .90).

**Procedure**

First, we randomly allocated participants to the nature (*n* = 160) or urban (*n* = 162) condition. Then, we sent them a text message inviting them to report (at an appointed time) to a park or a plaza for the study, run in the months of April and May. Participants were met at the testing site by one of four female research assistants, the same as in Study 2. The research assistants were unaware of hypotheses and randomly allocated to testing sites. Participants were requested to take a rest and observe their surroundings for 5 minutes. Then, they were instructed to describe in writing, in at least five lines, “their environment and their feelings evoked by the environment.” No time limit was set, although all participants completed the task in under 10 minutes and proceeded to fill out the measures described below.

***Basic Psychological Needs Scale***

This scale (Sheldon et al., 2001) comprises six items, preceded by the stem “Right now, I feel….” Two items refer to autonomy (e.g., “free to do things my own way”; *M* = 5.25, *SD* = 1.04; ɑ = .82), two to competence (e.g., “very capable in what I did”; *M* = 4.96, *SD* = 1.16; ɑ = .81), and two to relatedness (e.g., “close and connected with other people who are important to me”; *M* = 4.93, *SD* = 1.15; ɑ = .82). Response options range from 1 (*strongly disagree*) to 7 (*strongly agree*). We presented the items in a fixed random order.

***State Authenticity Scale***

Participants completed the state version of the Authenticity Scale (Lenton, Slabu et al., 2013), as in Study 2 (*M* = 4.42, *SD* = .80; ɑ = .81).

**Results and Discussion**

***Basic Psychological Needs***

Participants in the nature condition (*M* = 5.46, *SD* = 1.05) reported higher autonomy satisfaction than those in the urban condition (*M* = 5.06, *SD* = .99), *t*(320) = 3.53, *p* < .001, Cohen’s *d* = .39, 95% CI [.17, .61]. Further, participants in the nature condition (*M* = 5.10, *SD* = 1.09) reported higher competence satisfaction compared to those in the urban condition (*M* = 4.83, *SD* = 1.22), *t*(320) = 2.15, *p* = .033, Cohen’s *d* = .24, 95% CI [.02, .46]. However, participants in the nature (*M* = 5.03, *SD* = 1.17) and urban (*M* = 4.84, *SD* = 1.12) condition did not differ significantly on relatedness satisfaction, *t*(320) = 1.43, *p* = .154, Cohen’s *d* = .16, 95% CI [-.06, .38], as in Yang et al. (2022, Study 2a).

***State Authenticity***

Participants in the nature condition (*M* = 4.54, *SD* = .75) reported higher authenticity than those in the urban condition (*M* = 4.30, *SD* = .67), *t*(320) = 2.98, *p* = .003, Cohen’s *d* = 0.33, 95% CI [.11, .55].

***Mediation Analysis***

In a mediation analysis (Hayes, 2018; 1 = nature condition, 0 = urban condition), we entered the dummy coded condition as independent variable, the three needs as mediators, and authenticity as dependent variable. First, we tested for the independent mediational role of autonomy, competence, and relatedness satisfaction. The results of bias-corrected bootstrapping with 5,000 resamples indicated that the indirect effects via autonomy and competence excluded zero: satisfaction of these two needs independently mediated nature’s effect on authenticity (Table 1S, Supplementary Materials)[[4]](#footnote-4). Relatedness was not a significant mediator.

**Figure 2**

*Autonomy Need Satisfaction Mediates the Effect of Nature on State Authenticity in Parallel Mediation Analysis in Study 3*

Nature (vs. Urban)

Autonomy

State Authenticity

.40\*\*\*

.19\*\*\*

.24\*\* (.15\*)

Competence

Relatedness

.28\*

.00

.04

.18

*Note*. \**p* < .05, \*\**p* < .01,\*\*\**p* < .001.

We then tested for parallel mediation of the three needs by entering them simultaneously in the model. The result of bias-corrected Bootstrapping with 5,000 resamples (Hayes, 2018) indicated that the total mediation effect was significant, *F*(4, 317) = 10.64, R2 = .12, *p* < .001, SE = .03, indirect effect *ab* = .08, 95% CI [.03, .16]. Only autonomy satisfaction significantly mediated the effect of nature on authenticity (Figure 2).

***Summary***

Nature increased need satisfaction and (in conceptual replication of Study 2 findings) state authenticity. Also, autonomy and competence (but not relatedness) independently mediated nature’s effect on state authenticity. Yet, in a parallel-mediation analysis, only autonomy emerged as a significant mediator of this effect. The results were consistent with the hypotheses.

**Study 4: On the Causal Relation Between Nature and Authenticity,**

**and Its Mediation by Positive Affect**

In experimental Study 4, we retested, in a laboratory context this time, the hypothesis that exposure to nature augments state authenticity. Additionally, we evaluated the hypothesis that positive affect mediates the effect of nature on state authenticity.

**Participants**

We used the Monte Carlo Power Analysis for Indirect Effects application to arrive at the sample size for the proposed mediation model (i.e., single mediator). As in Study 3, we assumed medium intercorrelations among the manipulation (nature vs. urban condition), mediator, and dependent variable (i.e., authenticity) of *r* = .30 (*SD* = .10). At least 160 participants were needed to reach power .80 at α = .05. We tested 171 Chinese undergraduate students (139 women, 32 men) at [MASKED] University in exchange for course credit. They ranged in age from 17 to 23 years (*M* = 19.94, *SD* = 1.19). We randomly assigned them to the nature (*n* = 85) or urban (*n* = 86) condition.

**Procedure**

Participants viewed 14 photographs of nature or urban scenes (Figure 3) immersing themselves into the scenes at their own pace. The stimuli and procedure have been validated by prior research (in China) on whether nature buffers the consequences of ostracism (Yang et al., 2021). Next, participants completed the Chinese version (Qiu et al., 2008) of the Positive and Negative Affect Scale (PANAS; Watson et al., 1988) indicating how they currently felt on each of nine positive (e.g., happy, active, enthusiastic) and nine negative (e.g., sad, nervous, afraid) adjectives (1 = *very slightly or not at all*, *5 = extremely*). We reverse-scored responses on the negative adjectives and combined them with those on the positive adjectives to form a positive affect score (*M* = 3.59, *SD* = .61, ɑ= .91). Afterward, participants completed the state version of the Authenticity Scale (Lenton, Slabu et al., 2013), as in Studies 2–3 (*M* = 4.69, *SD* = .84, ɑ = .82).

**Figure 3**

*Sample Photographs in Study 4: Nature Condition (Upper Two Photographs) Versus Urban Condition (Lower Two Photographs)*





**Results and Discussion**

Participants in the nature condition (*M* = 3.76, *SD* = .54) reported more positive affect than those in the urban condition (*M* = 3.44, *SD* = .62), *t*(169) = 3.57, *p* < .001, Cohen’s *d* = .55, 95% CI [.25, .85]. Also, participants in the nature condition (*M* = 4.73, *SD* = .84) reported higher authenticity than their urban condition counterparts (*M* = 4.44, *SD* = .92), *t*(169) = 2.17, *p* = .032, Cohen’s *d* = .33, 95% CI [.03, .63].

**Figure 4**

*Positive Affect Mediates the Effect of Nature on State Authenticity in Study 4*

Nature

(vs. Urban)

Positive Affect

State Authenticity

.32\*\*\*

.47\*\*\*

.29\* (.14)

*Note*. \**p* < .05, \*\**p* < .01, \*\*\**p* < .001.

We used the same procedure as in Study 3 to test whether positive affect mediated the effect of nature on authenticity. The results of bias-corrected bootstrapping with 5,000 resamples revealed significant mediation, *F*(2, 168) = 11.54, *R*2 = .12, *p* < .001, *SE* = .05, indirect effect *ab* = .15, 95% CI [.06, .28] (Figure 4)[[5]](#footnote-5). Taken together, exposure to natural (vs. urban) environments led to increases in state authenticity, and these increases were transmitted by positive affect.

**Study 5: On the Causal Relation Between Nature and Authenticity,**

**and Its Mediation by Self-Esteem**

In experimental Study 5, conducted in the laboratory, we again tested the hypothesis that nature augments authenticity using a new experimental procedure (i.e., video presentation). Moreover, we evaluated the hypotheses that self-esteem mediates the effect of nature on authenticity.

**Participants**

We conducted power analysis as in Study 4 to determine our sample size (minimum needed = 160). We tested 165 Chinese undergraduate students (97 women, 68 men) at [MASKED] University, aged between 17 and 22 years (*M* = 19.51, *SD* = 1.03). We remunerated each with 10 Yuan (≈ $1.50).

**Procedure**

We randomly assigned participants to the nature (*n* = 82) or urban (*n* = 83) condition. In the nature condition they watched a 5-minute video depicting natural environments (i.e., forests, rivers, beaches, meadows, mountains), whereas in the urban condition they watched a similar-length video depicting urban environments (i.e., streets, roads, cars, buildings, plazas). The videos, downloaded from the internet and edited by the first author, were played mutely so as to control for the possible confounding effect of voice[[6]](#footnote-6). We asked participants to immerse themselves into their respective environment and be aware of “their feelings evoked by the environment.”

Subsequently, participants completed measures of the putative mediator (self-esteem) and the dependent variable (state authenticity). We assessed self-esteem with a state version of the 10-item Rosenberg (1965) self-esteem scale (for the Chinese version, see: Ji & Yu, 1999), with each item being preceded by the stem “Right now” (1 = *strongly disagree*, 4 = *strongly agree*; *M* = 2.98, *SD* = .46, ɑ= .84). We assessed authenticity with the state version of the Authenticity Scale (Lenton, Slabu et al., 2013), as in Studies 2–4 (*M* = 4.75, *SD* = .50, ɑ= .66).

**Results and Discussion**

Participants in the nature condition (*M* = 3.08, *SD* = .49) reported higher self-esteem than those in the urban condition (*M* = 2.89, *SD* = .41), *t*(163) = 2.67, *p* = .008, Cohen’s *d* = .42, 95% CI [.11, .72]. Also, participants in the nature condition (*M* = 4.85, *SD* = .47) reported higher authenticity than those in the urban condition (*M* = 4.66, *SD* = .51), *t*(163) = 2.57, *p* = .011, Cohen’s *d* = .40, 95% CI [.09, .71]. Further, self-esteem mediated the effect of nature on authenticity[[7]](#footnote-7), *F*(2, 162) = 70.67, *R*2 = .47, *p* < .001, *SE* = .05, indirect effect *ab* = .14, 95% CI [.04, .25] (Figure 5). In summary, watching videos of natural (vs. urban) environments elevated state authenticity, an effect mediated by state self-esteem.

**Figure 5**

*Self-Esteem Mediates the Effect of Nature on State Authenticity in Study 5*

Nature

(vs. Urban)

Self-Esteem

State Authenticity

.19\*\*

.72\*\*\*

.20\* (.06)

*Note*. \**p* < .05, \*\**p* < .01,\*\*\**p* < .001.

**Study 6: On the Causal Relation Between Nature and Authenticity,**

**and Its Mediation by Mindfulness**

In experimental Study 6, carried out in the laboratory, we re-tested the hypothesis that nature raises authenticity with a novel procedure (i.e., engaging in a nature-based vs. control activity). More important, we tested the hypothesis that mindfulness mediates the effect of nature on authenticity.

**Participants**

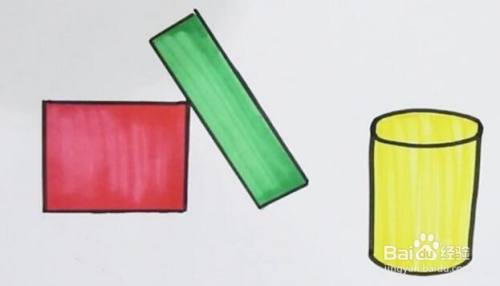
We implemented the same power analysis as in Studies 4 and 5 to determine our sample size (minimum needed = 160). We tested 161 Chinese undergraduate students (137 women, 24 men) at [MASKED] University, aged 17 to 23 years (*M* = 19.30, *SD* = 1.01). We paid each 15 Yuan (≈ $2.25).

**Procedure**

We randomly assigned participants to the nature (*n* = 81) or control (*n* = 80) condition. We adopted a manipulation introduced by Berger (2020). In the nature condition we instructed participants to create a natural poster using nature-related materials (i.e., fallen leaves, branches, petals, weeds), whereas in the control condition we instructed them to create a geometric poster using artificial materials (i.e., triangles, circles, rectangles, polygons; Figure 6). The relevant materials were provided by the experimenter (along with a piece of A4 paper, a box of crayons, and a bottle of glue). We gave participants 10 minutes to complete the task.

**Figure 6**

*Sample Paintings Created by a Participant in Study 6: Natural (Left) Versus Geometric (Right)*

****

Afterward, participants filled out a 13-item mindfulness scale developed by Lau et al. (2006). It consists of two subscales, curiosity (reflecting awareness of the present-moment experience; six items) and decentering (reflecting acceptance of the present-moment experience; seven items). Given that we intended to capture the transient character of mindfulness in our experimental context, we opted to shorten the scale. Our primary item selection criterion was high factor loadings, and our secondary criterion was high face validity (see Sibley et al., 2005, for a similar practice). We arrived at three curiosity and three decentering items, which we administered to participants after we thematically blocked them. A sample curiosity item is “I was curious about each of the thoughts and feelings that I was having,” and a sample decentering item is “I was more invested in just watching my experiences as they arose, than in figuring out what they could mean.” Response options ranged from 1 (*strongly disagree*) to 7 (*strongly agree*; *M* = 5.18, *SD* = .72, ɑ = .68). We assessed authenticity with the state version of the Authenticity Scale (Lenton, Slabu et al., 2013), as in Studies 2-5 (*M* = 4.90, *SD* = .64, ɑ= .62).

**Results and Discussion**

Participants in the nature condition (*M* = 5.30, *SD* = .70) reported higher mindfulness than those in the control condition (*M* = 5.05, *SD* = .73), *t*(159) = 2.28, *p* = .024, Cohen’s *d* = 0.36, 95% CI [.05, .67]. Also, participants in the nature condition (*M* = 5.03, *SD* = .64) reported greater authenticity than controls (*M* = 4.76, *SD* = .62), *t*(159) = 2.69, *p* = .008, Cohen’s *d* = 0.42, 95% CI [.11, .73]. In turn, mindfulness mediated nature’s effect on authenticity[[8]](#footnote-8), *F*(2, 158) = 22.85, *R*2 = .22, *p* < .001, *SE* = .05, indirect effect *ab* = .10, 95% CI[.02, .21] (Figure 7). Together, creating a natural (vs. geometric) poster increased state authenticity, and this effect was transmitted by state mindfulness.

**Figure 7**

*Mindfulness Mediates the Effect of Nature on State Authenticity in Study 6*

Nature

(vs. Urban)

Mindfulness

State Authenticity

.17\*

.72\*\*\*

.19\* (.07)

*Note*. \**p* < .05, \*\*\**p* < .001.

# Study 7: The Nature-Authenticity Link and the Role of Self-Esteem

So far, we have found that exposure to nature is either linked with authenticity or increases authenticity. We have also found that the effect of nature on authenticity is independently mediated by satisfaction of the need for autonomy, positive affect, self-esteem, and mindfulness. In Study 7, we questioned the relative potency of these four mediators. Which one accounts best for nature’s effect on authenticity? To answer this question, we tested the strength of these mediators both independently and in parallel in a cross-sectional design. Participants completed measures of nature connectedness, autonomy satisfaction, positive affect, mindfulness, self-esteem, and authenticity (measured with an alternative scale, the Authenticity Inventory [Kernis & Goldman, 2006]). We tested the following hypotheses: (1) nature connectedness is positively related to autonomy satisfaction, positive affect, mindfulness, self-esteem, and authenticity; (2) The relation between nature connectedness and authenticity is independently mediated by autonomy satisfaction, positive affect, mindfulness, and self-esteem; and (3) self-esteem is the most potent mediator.

**Participants**

We relied on an opportunistic sample of 1753 Chinese undergraduate students (881 men, 872 women) at [MASKED] University aged 17-24 years (*M* = 19.56, *SD* = .83; 131 unreported). We administered the measures in-person, as part of the first-year battery of psychological tests.

**Measures**

We measured the relevant constructs at the trait level. We assessed the predictor, nature connectedness, with the Connectedness to Nature Scale (Geng et al., 2015; Mayer & Frantz, 2004; *M* = 5.09, *SD* = .86, ɑ = .91). We proceeded with the assessment of the putative mediators in a fixed random order. First, we assessed autonomy need satisfaction (Sheldon et al., 2001; *M* = 4.81, *SD* = 1.22, ɑ = .91) and self-esteem (Ji & Yu, 1999; Rosenberg, 1965; *M* = 2.91, *SD* = .50, ɑ = .77). Then, we assessed positive affect using four positive (e.g., pleasant, happy) and four negative (e.g., sad, afraid) adjectives from the Scale of Positive and Negative Experience (Diener et al., 2010; for the Chinese version, see: Tong & Wang, 2017; 1 = *not at all*, 7 = *very strong*). After reverse-scoring responses to the negative adjectives, we computed a composite (*M* = 4.88, *SD* = 1.03, ɑ = .92). Subsequently, we assessed mindfulness with the 15-item Chinese version (Chen et al., 2012) of the Mindful Attention Awareness Scale; original scale: Brown and Ryan (2003). A sample item is “I could be experiencing some emotion and not be conscious of it until some time later” (1 = *strongly disagree*, 7 = *strongly agree*; *M* = 4.14, *SD* = .98, ɑ = .94). Finally, we assessed authenticity with the 45-item Authenticity Inventory (Kernis & Goldman,2006).It captures four proposed components of authenticity: Awareness (e.g., “For better or for worse I am aware of who I truly am”), Unbiased Processing (e.g., “I am very uncomfortable objectively considering my limitations and shortcomings”), Behavioral Consistency (e.g., “I am willing to change myself for others if the reward is desirable enough”), and Relational Orientation (e.g., “If asked, people I am close to can accurately describe what kind of person I am.” Response options range from 1 (*strongly disagree*) to 7 (*strongly agree*). We computed a composite (*M* = 4.42, *SD* = .54, ɑ = .89).

**Results and Discussion**

The six variables exhibited a positive manifold (Table 1). In particular, nature connectedness was related to authenticity. Also, nature connectedness was related to autonomy need satisfaction, self-esteem, positive affect, and mindfulness. Lastly, autonomy need satisfaction, self-esteem, positive affect, and mindfulness were related to authenticity.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Table 1**  *Intercorrelations of Variables in Study 7* | | | | | | |
|  | 1 | 2 | 3 | 4 | 5 | 6 |
| 1. Nature Connectedness | -- |  |  |  |  |  |
| 1. Autonomy Satisfaction | .42\*\*\* | -- |  |  |  |  |
| 3. Positive Affect | .46\*\*\* | .50\*\*\* | -- |  |  |  |
| 4. Self-Esteem | .47\*\*\* | .50\*\*\* | .65\*\*\* | -- |  |  |
| 1. Mindfulness | .25\*\*\* | .17\*\*\* | .37\*\*\* | .40\*\*\* | -- |  |
| 1. Authenticity | .58\*\*\* | .43\*\*\* | .56\*\*\* | .60\*\*\* | .57\*\*\* | -- |
| *Note*. \**p* < .05, \*\**p* < .01,\*\*\**p* < .001; df = 1753 | | | | | | |

Next, we conducted independent mediation analyses. As hypothesized, autonomy satisfaction, positive affect, self-esteem, and mindfulness independently mediated the effect of nature on state authenticity (For detailed statistics, see Table 5S). Lastly, we carried out a parallel mediation analysis. The result of bias-corrected Bootstrapping with 5,000 resamples (Hayes, 2018) indicated that the total mediation effect was significant, *F*(5, 1747) = 514.07, *R*2 = .60, *p* < .001, SE = .011, indirect effect *ab* = .17, 95% CI [.15, .19]. As hypothesized, self-esteem emerged as the strongest mediator of nature’s effect on authenticity, followed closely by mindfulness (Table 2, Figure 8)[[9]](#footnote-9).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Table 2**  *Parallel Mediation Analysis in Study 7* | | | | | | |
| mediators | a path | b path | c path | c' path | SE | *ab*  95%CI |
| Autonomy Satisfaction | .59\*\*\* | .04\*\*\* | .36\*\*\* | .19\*\*\* | .006 | .024  [.01, .04] |
| Positive Affect | .56\*\*\* | .05\*\*\* | .007 | .030  [.02, .04] |
| Self-Esteem | .27\*\*\* | .22\*\*\* | .008 | .061  [.05, .08] |
| Mindfulness | .29\*\*\* | .20\*\*\* | .007 | .057  [.04, .07] |
| Model Summary: *F*(5, 1747) = 514.07, R2 = .60, *p* < .0001, SE = .011, indirect effect  *ab* = .17, 95% CI [.15, .19] | | | | | | |

**Figure 8**

*Parallel Mediation Analysis of the Effect of Nature on Authenticity in Study 7*

Nature (vs. Urban)

Authenticity

.36\*\* (.19\*\*\*)

Self-Esteem

Mindfulness

.27\*\*\*

.22\*\*\*

.20\*\*\*

.29\*\*\*

Positive Affect

Autonomy Satisfaction

.56\*\*\*

.05\*\*\*

.59\*\*\*

.04\*\*\*

*Note*. \**p* < .05, \*\**p* < .01,\*\*\**p* < .001.

**Study 8: The Effect of Nature on Authenticity and the Role of Self-Esteem**

In Study 7, we gauged the relative potency of the four mediators in a correlational design. In online Study 8, we attempted to do so in an experimental design. Participants viewed a 5-minute video depicting nature (vs. urban) scenes and filled out scales assessing the four plausible mediators as well as the dependent variable (i.e., authenticity) at the state level. We hypothesized that: (1) participants in the nature (vs. urban) condition would report higher autonomy need satisfaction, positive affect, self-esteem, mindfulness, and authenticity; (2) Nature’s effect on authenticity would be independently mediated by autonomy need satisfaction, positive affect, mindfulness, and self-esteem; (3) self-esteem would emerge as the most potent mediator in a parallel mediation analysis.

**Participants**

As before, we used the Monte Carlo Power Analysis for Indirect Effects application to determine the sample size for the proposed mediation model with four parallel mediators (i.e., autonomy need satisfaction, positive affect, mindfulness, self-esteem). Given that nature’s effect is medium (based on our prior studies), we assumed medium intercorrelations among the manipulation (nature vs. urban), putative mediators, and dependent variable (i.e., authenticity) of *r* = .30 (*SD* = .10). Accordingly, we needed at least 400 participants to reach power .80 at α = .05. We recruited 416 Chinese undergraduate students (262 women, 154 men) at [MASKED] University compensating them with 10 Yuan (≈ $1.50). Their ages ranged from 17 to 27 years (*M* = 19.79, *SD* = 1.38).

**Procedure**

We randomly assigned participants to the nature (*n* = 207) or urban (*n* = 209) condition, in which they watched the same videos as in Study 5. Next, they completed the relevant measures. We presented the four plausible mediators in one fixed random order (as below), followed by the dependent variables.

All measures were preceded by the stem “Right now.” We measured mindfulness with the 6-item mindfulness scale (adapted from Lau et al., 2006; *M* = 5.12, *SD* = .93, ɑ = .76). We measured positive affect with the Chinese version of PANAS(Qiu et al., 2008; *M* = 3.59, *SD* = .54, ɑ= .86). We measured autonomy need satisfaction with the two relevant items of the Basic Psychological Needs Scale (Sheldon et al., 2001; *M* = 4.96, *SD* = 1.43, ɑ= .83). We measured self-esteem with the Rosenberg (1965) Self-Esteem scale (Ji & Yu, 1999; *M* = 2.99, *SD* = .43, ɑ= .82). Finally, we measured authenticity with the state version of the Authenticity Scale (Lenton, Slabu et al., 2013), as before (*M* = 4.65, *SD* = .79, ɑ= .78).

**Results and Discussion**

Participants in the nature condition reported higher autonomy need satisfaction, positive affect, self-esteem, mindfulness, and authenticity than those in the urban condition (Table 3). Next, we carried out mediation analyses testing independently for each potential mediator. Autonomy need satisfaction, positive affect, self-esteem, and mindfulness independently mediated the effect of nature on state authenticity[[10]](#footnote-10) (Table 7S, Supplementary Materials).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Table 3**  *The Effect of Condition (Nature vs. Urban) on Variables Assessed in Study 8* | | | | | |
|  | Conditions  *M* (*SD*) | |  |  |  |
| Variables | Nature  (*n* *=* 207) | Urban  (*n =* 209) | *t*(414) | *p* | Cohen’s *d*  95% CI |
| Autonomy Satisfaction | 5.24 (1.31) | 4.68 (1.48) | 4.13 | < .001 | .41  [.21, .60] |
| Positive Affect | 3.78 (.54) | 3.41 (.62) | 6.50 | < .001 | .64  [.44, .83] |
| Self-Esteem | 3.07 (.39) | 2.91 (.45) | 3.98 | < .001 | .39  [.20, .58] |
| Mindfulness | 5.33 (.88) | 4.91 (.94) | 4.74 | < .001 | .47  [.27, .66] |
| Authenticity | 4.76 (.75) | 4.54 (.82) | 2.91 | .004 | .29  [.09, .48] |

Finally, we conducted a parallel mediation analysis. The total effect was significant, *F*(5, 410) = 56.71, R2 = .41, *p* < .001, *SE* = .05, indirect effect *ab* = .25, 95% CI [.15, .36]. However, only self-esteem and mindfulness significantly mediated the effect of nature on authenticity (Figure 9). Furthermore, the indirect effect of nature (vs. urban) on authenticity through self-esteem (*ab* = .16) was larger than through mindfulness (*ab* = .05). Self-esteem emerged as the most potent mediator of nature’s effect on state authenticity. In all, the results were consistent with hypotheses.

**Figure 9**

*Parallel Mediation Analysis of the Effect of Nature on Authenticity in Study 8*

Nature (vs. Urban)

Authenticity

.22\*\* (-.03)

Self-Esteem

Mindfulness

.17\*\*\*

.97\*\*\*

.13\*\*

.42\*\*\*

Positive Affect

Autonomy Satisfaction

.37\*\*\*

.12

.57\*\*\*

-.02

*Note*. \**p* < .05, \*\**p* < .01,\*\*\**p* < .001.

**Study 9: The Effect of Nature on Authenticity and the Role of Self-Esteem**

**in Western Cultural Context**

In Study 8, and all preceding studies, participants were Chinese. We conducted preregistered Study 9—an exact replication of Study 8—for two reasons. First, we aimed to examine the reproducibility of Study 8; this study is crucial, as it established experimentally the role of self-esteem in transmitting the effect of nature on authenticity. Second, we aimed to expand the generalizability of our findings by targeting a Western sample.

**Participants**

We determined the sample size as in Study 8. We needed at least 400 participants to reach power .80 at α = .05. We recruited 442 participants via Prolific Academic in exchange of £2 ($2.46). This online platform automatically excluded 15 participants, because they completed the study in less than 7 min. (As a reminder, the study consisted of a 5-min video and a 51-question survey.) We also excluded 14 participants, as they were from non-Western countries. The final sample comprised 413 participants (236 women, 172 men, 5 other) ranging in age from 19 to 75 years (*M* = 37.42, *SD* = 12.77). They were from the United Kingdom (288), Canada (83), USA (35), Sweden (3), Australia (1), Ireland (1), Spain (1), or Switzerland (1).

**Procedure**

We randomly assigned participants to the nature (*n* = 204) or urban (*n* = 209) condition. The procedure was identical to that of Study 8 (and Study 5). After watching the relevant video, participants completed state measures of: mindfulness (Mindfulness Scale—Lau et al., 2006; *M* = 4.68, *SD* = .90, ɑ = .75), positive affect (PANAS—Watson et al., 1988; *M* = 3.59, *SD* = .53, ɑ= .86), autonomy (Basic Psychological Need of Autonomy subscale—Sheldon et al., 2001; *M* = 5.52, *SD* = 1.17, ɑ= .88), self-esteem (the Rosenberg [1965] Self-esteem Scale; *M* = 2.99, *SD* = .65, ɑ= .94), and authenticity (Authenticity Scale— Lenton, Slabu et al., 2013; *M* = 5.11, *SD* = .94, ɑ= .87).

**Results and Discussion**

Participants in the nature condition reported significantly higher autonomy need satisfaction, positive affect, self-esteem, and authenticity (as well as directionally higher mindfulness) than those in the urban condition (Table 4). Next, we carried out mediational analyses testing independent mediation by autonomy need satisfaction, positive affect, and self-esteem. Each mediated nature’s effect on authenticity[[11]](#footnote-11) (Table 8S, Supplementary Materials).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Table 4**  *The Effect of Condition (Nature vs. Urban) on Variables Assessed in Study 9* | | | | | |
|  | Conditions  *M* (*SD*) | |  |  |  |
| Variables | Nature  (*N =* 204) | Urban  (*N =* 209) | *t*(411) | *p* | Cohen’s *d*  95% CI |
| Autonomy Satisfaction | 5.63 (1.13) | 5.38 (1.26) | 2.08 | .038 | .21  [.01, .40] |
| Positive  Affect | 3.71 (.52) | 3.46 (.52) | 4.90 | < .001 | .48  [.29, .68] |
| Self-Esteem | 3.08 (.62) | 2.90 (.67) | 2.74 | .006 | .27  [.08, .46] |
| Mindfulness | 4.74 (.94) | 4.60 (.90) | 1.60 | .110 | .16  [-.04, .35] |
| Authenticity | 5.23 (.99) | 4.98 (.91) | 2.71 | .007 | .27  [.07, .46] |

Finally, we carried out a parallel mediation analysis involving autonomy need satisfaction, positive affect, and self-esteem. The total effect was significant, *F*(4, 408) = 102.45, R2 = .50, *p* < .001, *SE* = .07, indirect effect *ab* = .20, 95% CI [.07, .34]. However, only self-esteem (indirect effect *ab* = .17, 95% CI [.05, .29]) significantly mediated nature’s effect on authenticity. The indirect effects of positive affect (*ab* = .02, 95% CI [-.02, .06]) and autonomy need satisfaction (*ab* = .01, 95% CI [-.001, .04]) were not significant (Figure 10). Self-esteem emerged as the most powerful mediator of nature’s effect on authenticity, replicating the Study 8 results.

**Figure 10**

*Parallel Mediation Analysis of the Effect of Nature on Authenticity in Study 9*

Nature (vs. Urban)

Authenticity

.25\*\* (.06, *ns*)

Self-Esteem

.18\*\*

.94\*\*\*

Positive Affect

.25\*\*\*

.08 (*ns*)

Autonomy Satisfaction

.24\*

.05 (*ns*)

*Note*. \**p* < .05, \*\**p* < .01,\*\*\**p* < .001, *ns* = not significant.

**Study 10: The Causal Influence of Self-Esteem on Authenticity**

We have shown that self-esteem is the strongest mediator of nature’s effect on authenticity. However, the logic of the experimental-causal-chain approach (Spencer et al., 2005), would require that we manipulate the mediator (i.e., self-esteem) and assess its impact on the dependent measure (i.e., authenticity). This is what we did in preregistered Study 10. We hypothesized that that high self-esteem participants would report greater authenticity than their low self-esteem counterparts.

**Participants**

We calculated the sample size using G\*Power 3.1 (Faul et al., 2007). To ensure 90% statistical power at α = .05, at least 172 participants were needed. We recruited 229 Chinese participants (130 women, 99 men) via Credamo, a Chinese online platform similar to Qualtrics, remunerating them with 10 Yuan (≈ $1.50). Their age ranged from 18 to 67 years (*M* = 33.14, *SD* = 9.12).

**Procedure**

We randomly assigned participants to the high (*n* = 114) or low (*n* = 115) self-esteem condition. We induced self-esteem with a procedure validated by Mahadevan et al. (2023). In the high self-esteem condition, participants thought about ways in which they felt like they were a person of worth, had a number of good qualities, and were satisfied with themselves. In the low self-esteem condition, participants thought about ways in which they did not have much to be proud of, felt like a bit of a failure, and felt a bit useless. Next, participants listed three relevant keywords and wrote about the pertinent ways for at least three minutes. Finally, they completed the manipulation check and a state authenticity measure.

**Manipulation check**. We used the Rosenberg (1965) Self-Esteem Scale as a manipulation check. We converted the scale to state format by adding the stem “right now” before each item. A sample item is: “ Right now, I feel that I am a person of worth, at least on an equal plane with others” (1 = *strongly disagree*, 7 = *strongly agree*). We averaged the ratings, after reverse-scoring the ratings for the negatively-worded items, to form an index (*M* = 4.60, *SD* = 1.56, ɑ= .94).

**Authenticity.** For cross-validational purposes, we assessed authenticity with two scales administered in counterbalanced order. The first one was the state version of the Authenticity Scale (Lenton, Slabu et al., 2013; *M* = 4.77, *SD* = 1.26, ɑ= .92), as before. The second one was the state Southampton Authenticity Scale (Kelley et al., 2022). Its four items, followed by the stem “Right now,” are: “I feel true to myself,” “I am feeling authentic, “I feel like the real me,” “I feel genuine” (1 = *strongly disagree*, 7 = *strongly agree*; *M* = 5.18, *SD* = 1.52, ɑ= .95). We calculated indices for each scale by averaging the ratings (following score-reversals in the case of the Rosenberg Self-Esteem Scale).

**Results and Discussion**

**Manipulation Check.** Participants in the high self-esteem condition (*M* = 5.84, *SD* = .53) reported higher levels of self-esteem than those in the low self-esteem condition (*M* = 3.38, *SD* = 1.25), *t*(227) = 19.40, *p* < .001, Cohen’s *d* = 2.56, 95% CI [2.30, 2.82]. The manipulation was effective.

**Authenticity.** The two authenticity scales were highly and positively related, *r*(229) = .91, *p* < .001. In regard to the Authenticity Scale, participants in the high self-esteem condition (*M* = 5.52, *SD* = .65) reported higher levels of authenticity than those in the low self-esteem condition (*M* = 4.03, *SD* = 1.28), *t*(227) = 11.13, *p* < .001, Cohen’s *d* = 1.47, 95% CI [1.21, 1.73]. In regard to the Southampton Authenticity Scale, participants in the high self-esteem condition (*M* = 6.00, *SD* = .64) also reported higher levels of authenticity than those in the low self-esteem condition (*M* = 4.38, *SD* = 1.69), *t*(227) = 9.59, *p* < .001, Cohen’s *d* = 1.27, 95% CI [1.01, 1.53]. The results were consistent with the hypothesis. The study is also the first to document the causal relation between self-esteem and authenticity.

**Study 11: The Impact of Nature, as Mediated Serially by Self-Esteem and Authenticity,**

**on Psychological Wellbeing**

In Studies 7–10, self-esteem emerged as the strongest mediator of the effect of nature on authenticity. In preregistered Study 11, we focused on nature and PWB. How does nature momentarily enhance PWB? We were concerned with serial mediation. In particular, we hypothesized that nature would increase self-esteem, which would be linked to higher authenticity and, in turn, greater PWB.

**Participants**

We determine the sample size for the proposed serial mediation model based on the Monte Carlo Power Analysis for Indirect Effects application (Schoemann et al., 2017). Given that the effect of nature is generally medium (based on our prior studies), we assumed medium intercorrelations among the manipulation (nature vs. urban), mediators, and PWB *r* = .30 (*SD* = .10). As such, at least 271 participants were required to reach power .80 at α = .05. We recruited 300 Chinese participants (158 women, 142 men) via Credamo, compensating them with 10 Yuan (≈ $1.50). Their ages ranged from 18 to 59 years (*M* = 30.05, *SD* = 8.16).

**Procedure**

We used the same manipulation (i.e., videos of nature or urban scenes) as in Studies 5, 8, and 9. Following random assignment to conditions (nature condition *n* = 147, urban condition *n* = 153), participant completed state measures of the putative mediators (self-esteem, authenticity) and the dependent variable (PWB).

**Self-Esteem.** We assessed this construct with the Rosenberg (1965) self-esteem scale, as in Studies 7–8(*M* = 3.26, *SD* = .38, ɑ= .83).

**Authenticity.** We assessed this construct with the state version of the Authenticity Scale (Lenton, Slabu et al., 2013), as in Studies 2–6, and 8 (*M* = 5.30, *SD* = .80, ɑ= .86).

**Psychological Well-being.** Aiming for brevity (due to the expected short duration of experimental effects), we opted to operationalize PWB in terms of life satisfaction and meaning in life. We assessed life satisfaction with the 5-item Satisfaction with Life Scale (Diener et al., 1985; for the Chinese version, see: Xiong & Xu, 2009). A sample item is: “In most ways my life is close to my ideal” (1 = *strongly disagree*, 7 = *strongly agree*; *M* = 5.11, *SD* = 1.10, ɑ= .87). We assessed meaning with the 5-item Presence of Meaning Subscale of the Meaning in Life Questionnaire (Steger et al., 2006; for the Chinese version, see: Jiang et al., 2016). A sample item is: “My life has a clear sense of purpose” (1= *strongly disagree*, 7 = *strongly agree M* = 5.70, *SD* = 1.04, ɑ= .88). In both case, the items were preceded by the stem: “Right now.”

**Results and Discussion**

Participants in the nature (vs. urban) condition reported higher self-esteem, authenticity, life satisfaction, and meaning in life (Table 5). Next, we carried out two serial mediation analyses (Model 6, 5,000 bootstraps; Hayes, 2018) with life satisfaction and meaning in life as dependent variables. In both cases, condition (1 = nature condition, 0 = urban condition) was the independent variable, whereas self-esteem and authenticity were the serial mediators[[12]](#footnote-12).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Table 5**  *The Effect of Condition (Nature vs. Urban) on Variables Assessed in Study 11* | | | | | |
|  | Conditions  *M* (*SD*) | |  |  |  |
| Variables | Nature  (*n =* 147) | Urban  (*n =* 153) | *t*(298) | *p* | Cohen’s *d*  95% CI |
| Self-Esteem | 3.32 (.28) | 3.21 (.46) | 2.55 | .011 | .30  [.07, .52] |
| Authenticity | 5.47 (.62) | 5.15 (.92) | 3.54 | < .001 | .41  [.18, .64] |
| Life Satisfaction | 5.30 (.96) | 4.93 (1.20) | 2.96 | .003 | .34  [.11, .57] |
| Meaning in Life | 5.82 (.81) | 5.57 (1.21) | 2.12 | .035 | .24  [.02, .47] |

As shown in Figure 11, the indirect effect of condition on life satisfaction through self-esteem and authenticity was significant, *a*1*d*21*b*2 = .06, 95% CI [.02, .13]. In addition, the indirect effect of condition on life satisfaction through self-esteem alone was significant, *a*1*b*1 = .16, 95% CI [.04, .29], as was the indirect effect of condition on life satisfaction through authenticity, *a*2*b*2 = .07, 95% CI [.02, .17].

**Figure 11**

*Self-Esteem and Authenticity Serially Mediate the Effect of Nature on Life Satisfaction in Study 11*

Nature

(vs. Urban)

Life Satisfaction

.09 (*ns*)

Self-Esteem

Authenticity

.11\*

.40\*\*\*

1.40\*\*\*

.18\*

1.28\*\*\*

*Note*. \**p* < .05, \*\**p* < .01,\*\*\**p* < .001, *ns* = not significant.

As displayed in Figure 12, the indirect effect of condition on meaning in life through self-esteem and authenticity was significant, *a*1*d*21*b*2 = .11, 95% CI [.03, .22]. The indirect effect of condition on meaning in life through self-esteem was also significant, *a*1*b*1 = .09, 95% CI [.03, .20], as was the indirect effect of condition on meaning in life through authenticity, *a*2*b*2 = .14, 95% CI [.04, .28]. Taken together, nature increased PWB by raising sequentially self-esteem and authenticity.

**Figure 12**

*Self-Esteem and Authenticity Serially Mediate the Effect of Nature on Meaning in Life in Study 11*

Nature

(vs. Urban)

Meaning in Life

-.09 (*ns*)

Self-Esteem

Authenticity

.11\*

.77\*\*\*

.83\*\*\*

.18\*

1.28\*\*\*

*Note*. \**p* < .05, \*\**p* < .01,\*\*\**p* < .001, *ns* = not significant.

**Study 12: The Long-Term Influence of Nature on Psychological Wellbeing**

**as Mediated by Authenticity**

Study 12 was interventional and longitudinal. We fostered nature involvement by asking participants to engage in a nature-related activity (vs. control) for a month. We assessed authenticity and PWB(indicated by life satisfaction, meaning in life, depression, anxiety, and stress) at the beginning (Time 1), and twice later (Time 2 and Time 3) with a 2-week interval. Compared with the control group, we expected that nature involvement would be linked to increases in authenticity and PWB. We further hypothesized that authenticity would mediate the relation between nature involvement and PWB.

**Method**

***Participants***

In Studies 1–9 and Study 11, nature’s effect on authenticity was small to medium. We anticipated a similarly sized effect in Study 12. Given that our primary analyses would be regression-based, we referred to Cohen’s (1988) indications of effect sizes (i.e., small = .14, medium = .39, large = .59). We expected a standardized beta of .26, the average value of small and medium effects (Fritz & MacKinnon, 2007).

We conducted a power analysis in G\*Power 3.1 (*F*-test—Linear multiple regression: Fixed model, *R*2 increase option; Faul et al., 2009). We set Cohen’s *f*2 to .0725 (*f*2 = *R*2/[1-*R*2]; .262/[1-.262]) to determine the sample size for obtaining 80% power to detect a small-to-medium effect of nature on authenticity and PWB. At least 111 participants were required.

We conducted an additional power analysis pertaining to the mediation by authenticity of the nature–PWBlink (Fritz & MacKinnon, 2007). Given the small-to-medium effect of nature on authenticity and the medium effect of authenticity on PWB(for a meta-analysis, see Sutton, 2020), we would need a minimum sample size of 126 to achieve 80% power using a percentile bootstrap approach (Hayes, 2018; Kenny & Judd, 2013).

We recruited 152 Chinese undergraduate students from [MASKED] University for a 3-wave study remunerating each with 15 Yuan (≈ $2.40). All students lived in dormitories. Of them, 19 did not complete measures pertinent to the second and/or third wave, and so we excluded them from data analysis. The resulting 133 participants (78 women, 55 men) ranged in age from 17 to 24 years (*M* = 18.63, *SD* = 1.07; seven participants did not report their age).

***Procedure***

Participants learned that they would complete measures of a psychological survey three times in the coming weeks. At Time 1, they filled out the authenticity and PWBmeasures. Afterward, they were randomly assigned to the nature involvement (*n* = 61) versus control (*n* = 72) condition. In the nature involvement condition, they received a flowerpot with daffodil bulbs. as a token of our appreciation for their involvement in the study; they were instructed to water the plant and photograph it every second day. In the control condition, participants received a notebook (of equal value with the flowerpot) as a token of our appreciation for their involvement; they were instructed to carry on with their daily schedules, as usual.

Two weeks later, participants were contacted via a text message and invited to fill out again the measures using an online link (Time 2). Those in the nature involvement condition were reminded to look after the plant and photograph it every second day. Finally, two weeks later (i.e., four weeks after Time 1), all of the participants were re-contacted via text messaging and requested to fill out the measure once again using an online link (Time 3). At exit interviews, all participants in the nature condition indicated that they watered and photographed their plants regularly, as instructed. Only five of the 61 participants in that condition reported that the plants had started to bloom at Time 3.

***Measures***

**Authenticity.** Participants completed the Authenticity Scale (Wood et al., 2008) three times: *Ms* = 4.42, 4.48, 4.53; *SDs* = .84, .84, .87; ɑ*s* = .84, .86, .89.

**Psychological Wellbeing.** Participants completed three PWBmeasures. One, assessing *life satisfaction*, was the 5-item Satisfaction with Life Scale (Diener et al., 1985; Xiong & Xu, 2009; 1 *= strongly disagree*, 7 *= strongly agree*). They filled it out three times: *Ms* = 4.44, 4.52, 4.62; *SDs* = 1.05, 1.13, 1.16; ɑ*s* = .82, .87, .88. The second scale, assessing *meaning in life*, was the 5-item Presence of Meaning Subscale of the Meaning in Life Questionnaire (Steger et al., 2006; Passmore et al., 2022; 1*= strongly disagree*, *7 = strongly agree*). Participants completed it three times: *Ms* = 5.08, 5.10, 5.11; *SDs* = 1.11, 1.10, 1.02; ɑ*s* = .89, .90, .87. The third scale was the Depression Anxiety Stress Scales (DASS; Lovibond & Lovibond, 1995). It comprises 21 items, seven of which pertain to depression (e.g., “I found it difficult to work up the initiative to do things”), seven to anxiety (e.g., “I felt I was close to panic”), and seven to stress (e.g., “I found myself getting agitated”). Response options ranged from 1 (*did not apply to me at all*) to 4 (*applied to me very much or most of the time*). Participants completed the same three times: *Ms* = 1.67, 1.62, 1.59; *SDs* = .38, .43, .44; ɑ*s* = .89, .92, .94.

**Results and Discussion**

**Authenticity.** At Time 1 (baseline), there was no significant difference between participants in the nature involvement (*M* = 4.45, *SD* = .78) and control (*M* = 4.41, *SD* = .89) conditions on authenticity, *t*(131) = .32, *p* = .749, Cohen’s *d* = .06, 95% CI [-.29, .40]. Our random assignment was effective. At Time 2, there was still no significant difference on authenticity between the two conditions (nature involvement: *M* = 4.55, *SD* = .85; control: *M* = 4.42, *SD* = .83), *t*(131) = .83, *p* = .396, Cohen’s *d* = .15, 95% CI [-.20, .49]. However, at Time 3, participants in the nature involvement condition (*M* = 4.74, *SD* = .87) reported higher authenticity than controls (*M* = 4.36, *SD* = .83), *t*(131) = 2.56, *p* = .011, Cohen’s *d* = .45, 95%CI [.10, .79]. The Condition × Time interaction was significant, *F*(2, 262) = 6.38, *p* = .002, *ηp*2 = .046, 90% CI [.01, .09].

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 6**  *Effect of Nature (vs. Control) on Change in Authenticity and Psychological Wellbeing (Life Satisfaction, Meaning in Life, Depression/Anxiety/Stress) in Study 12* | | | | | | | | |
|  | Authenticity | | Life Satisfaction | | Meaning in Life | | DASS | |
| Predictor | *b* | *SE* | *b* | *SE* | *b* | *SE* | *b* | *SE* |
| Intercept | 4.42\*\*\* | .10 | 4.38\*\*\* | .12 | 4.97\*\*\* | .13 | 1.67\*\*\* | .04 |
| Condition | .02 | .14 | .09 | .18 | .07 | .20 | -.01 | .07 |
| Time | -.01 | .02 | .00 | .03 | -.02 | .02 | .00 | .01 |
| Condition × Time | .08\*\* | .02 | .10\*\* | .04 | .11\*\* | .04 | -.05\*\*\* | .01 |
| *Note.*DASS = Depression Anxiety Stress Scale, \**p* < .05, \*\**p* < .01,\*\*\**p* < .001. | | | | | | | | |

We applied longitudinal multilevel analysis to model the effect of nature involvement (vs. control) on authenticity. Level 1 consisted of assessments at repeated time points nested within each participant, whereas level 2 unit consisted of each participant. We allowed both the intercept and linear slope of authenticity to differ randomly across participants. We coded condition (1 = nature involvement, 0 = control) as a time-invariance covariant. To examine how authenticity changed over time across conditions, we added condition, time, and their interaction in the regression model, with the Condition × Time interaction characterizing the nature (vs. control) effect on authenticity over time. Consistent with the abovementioned analysis, the results (presented in Table 6) showed that the starting level of authenticity did not differ between conditions (*γCondition* = .02, *SE* = .14, *p* = .901). More important, although authenticity among control participants did not change over time (*γtime* = -.01, *SE* = .02, *p* = .503), authenticity increased significantly over time among nature participants (*γtime X Group* = .08, *SE* = .02, *p* = .001). Plant cultivation for a month (vs. control) was accompanied by rises in authenticity.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Table 7**  *Effect of Nature (vs. Control) on Psychological Wellbeing (Life Satisfaction, Meaning in Life, Depression/Anxiety/Stress) at Time 1 and Time 2 in Study 12* | | | | | | |
|  |  | *M*(*SD*) | | *t*(131) | *p* | Cohen’s *d*  95% *CI* |
| Nature  (*n* = 61) | Control  (*n* = 72) |
| Life Satisfaction | Time 1 | 4.49(1.08) | 4.42(1.05) | .36 | .723 | .06  [-.28, .41] |
| Time 2 | 4.64(1.18) | 4.30(1.07) | 1.74 | .084 | .30  [-.04, .65] |
| Meaning in Life | Time 1 | 5.03(1.18) | 4.99(1.09) | .21 | .835 | .04  [-.31, .38] |
| Time 2 | 5.23(1.14) | 4.89(1.06) | 1.78 | .078 | .31  [-.04, .65] |
| DASS | Time 1 | 1.65(.39) | 1.68(.39) | -.34 | .736 | -.06  [-.40, .29] |
| Time 2 | 1.58(.42) | 1.66(.44) | -1.16 | .249 | -.20  [-.55, .14] |
| *Note.*DASS = Depression Anxiety Stress Scale, \**p* < .05, \*\**p* < .01,\*\*\**p* < .001. | | | | | | |

**Psychological Wellbeing.** There was no difference on life satisfaction, meaning in life, and depression/anxiety/stress between participants in the nature involvement versus control condition at Time 1 or Time 2 (Table 7). Differences, though, emerged at Time 3. Participants in the nature involvement condition (*M* = 4.90, *SD* = 1.17) reported higher life satisfaction than controls *M* = 4.43, *SD* = 1.13), *t*(131) = 2.33, *p* = .021, Cohen’s *d =* .41, 95% CI [.06, .75]. Likewise, participants in the nature involvement condition (*M* = 5.38, *SD* = 1.03) reported higher meaning in life than controls (*M* = 4.91, *SD* = .97), *t*(131) = 2.68, *p* = .008, Cohen’s *d =* .47, 95% CI [.12, .81]. Similarly, participants in the nature involvement condition (*M* = 1.46, *SD* = .41) reported lower depression, anxiety, and stress than controls (*M* = 1.69, *SD* = .44), *t*(131) = -3.09, *p* = .002, Cohen’s *d =* .54, 95% CI [-.88, -.19]. A repeated measures Multivariate Analysis of Variance yielded a significant Condition × Time interactions on: satisfaction with life: *F*(2, 262) = 3.71, *p* = .027, *ηp*2 = .028, 90% CI [.00, .07]; meaning in life: *F*(2, 262) = 5.05, *p* = .007, *ηp*2 = .037, 90% CI [.00, .09]; and depression/anxiety/stress, *F*(2, 262) = 6.66, *p* = .002, *ηp*2 = .048, 90% CI [.01, .10]. Stated otherwise, nature involvement significantly increased life satisfaction and meaning in life, and significantly decreased depression, anxiety, and stress over time compared to control (Table 7). Finally, we conducted a longitudinal multilevel analysis followed the same procedure as we did for authenticity. We found a consistent pattern of results: nature involvement significantly increased all indicators of PWBover time compared to control (Table 6).

|  |  |  |  |  |  |  |  |
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| **Table 8**  *Effects of Initial Authenticity and Change in Authenticity on Psychological Wellbeing (Life Satisfaction, Meaning in Life, Depression/Anxiety/ Stress) Over Time in Study 12* | | | | | | | |
|  | Life Satisfaction | | Meaning in Life | | DASS | | |
| Predictor | *b* | *SE* | *b* | *SE* | *b* | *SE* |
| Intercept | 4.70\*\*\* | .12 | 5.40\*\*\* | .13 | 1.52\*\*\* | .04 |
| Condition | .08 | .16 | .05 | .16 | -.00 | .06 |
| Time | .01 | .03 | -.03 | .03 | -.00 | .01 |
| Condition ×Time | .07 | .04 | .08 | .04 | -.04\* | .01 |
| Initial Authenticity | .55\*\*\* | .10 | .72\*\*\* | .10 | -.26\*\*\* | .03 |
| Initial Authenticity × Time | .01 | .02 | -.02 | .02 | -.01 | .01 |
| Authenticity Change | .41\*\*\* | .09 | .35\*\*\* | .08 | -.19\*\*\* | .03 |
| Indirect Effect |
| Condition → Authenticity Slope → Psychological Wellbeing Slope | .03 [.02, .05] | | .03 [.01, .05] | | -.01 [-.02, -.01] | |
| *Note.*DASS = Depression Anxiety Stress Scales, \**p* < .05, \*\**p* < .01,\*\*\**p* < .001. | | | | | | |

**Mediation Analysis.** Next, we examined whether the effect of nature involvement (vs. control) on PWBwas mediated by change in authenticity (see Figure 13 for the relevant theoretical model). Specifically, we tested two effects of authenticity under the framework of longitudinal multilevel analysis: (1) the initial level of authenticity, which is a level-2, between-person effect by grand mean centering the baseline level of authenticity, and (2) change in authenticity, which is a level-1, within-person effect by subtracting the baseline score from authenticity score at each time point. Thus, we added in the model the initial level of authenticity, its interaction with time, and change in authenticity from baseline to predict PWB. As hypothesized, for all the outcomes, the Condition × Time interaction decreased. Furthermore, we used Mediation package (Tofighi & MacKinnon, 2011) in R to test the indirect effect. We found significant indirect effect of nature involvement (vs. control) on PWBthrough increasing authenticity (Table 8).

**Figure 13**

*Effect of Nature Involvement (vs. Control) on Psychological Wellbeing Change as Mediated by Change in Authenticity in Study 12*

Nature Involvement (vs. Control)

Psychological Wellbeing

Authenticity

Time

**Internal Meta-Analyses**

We carried out a series of internal meta-analyses in an effort to consolidate the findings. We first conducted a meta-analysis estimating the size of nature’s effect on authenticity across all quasi-experimental and experimental studies (Studies 2–6, 8–9, and 11) via the metafor package in R (Viechtbauer, 2010). We obtained a significant and medium-size effect (*d* = .33, *p* < .001, 95% CI [.25, .41]). We also estimated the size of nature’s effect on authenticity separately for each factor of the Authenticity scale (Lenton, Slabu et al., 2013; Wood et al., 2008) . We observed significant and medium-to-small effects sizes for all three factors: for authentic living, *d* = .33, *p* < .001, 95% CI [.25, .42]; for acceptance of external influence, *d* = -.22, *p* = .007, 95% CI [-.38, -.06], for acceptance of self-alienation, *d* = -.19, *p* < .001, 95% CI [-.28, -.11].

In the next meta-analysis, we tested whether nature’s effect on authenticity varies as a function of type of exposure (i.e., real nature vs. digital nature)[[13]](#footnote-13). We obtained null findings (*d* = .03, *p* = .728, 95% CI [-.15, .21]): nature’s influence on authenticity was independent of exposure type. In addition, the effects of nature on the three factors of authenticity did not vary across different nature exposure types (*p*s > .458): for authentic living: *d* = -.02, *p* = .868, 95% CI [-.19, .16]; for low acceptance of external influence, *d* = -.13, *p* = .458, 95% CI [-.47, .21]; for low self-alienation, *d* = .04, *p* = .624, 95% CI [-.13, .22].

Finally, in an attempt to quantify fit discrepancies between the hypothesized and alternative model, we conducted a meta-analysis of experimental studies that assessed self-esteem as a mediator (Studies 5, 8, 9, and 11). The results indicated that the hypothesized model (indirect effect *ab* = .15, *SE* = .03, 95% CI [.10, .20]) fit better than the alternative model (indirect effect *ab* = .09, *SE* = .02, 95% CI [.06, .12]). Also, we performed a meta-analyses comparing the mediational strength of self-esteem (nature → self-esteem → authenticity; Studies 5, 8, 9, and 11) with that of mindfulness (nature→ mindfulness→ authenticity; Studies 6, 8, and 9; Viechtbauer, 2010). The mediational effect of self-esteem was significant (indirect effect *ab* = .15, *SE* = .03, 95% CI [.10, .20]), whereas the mediational effect of mindfulness was not significant (indirect effect *ab* = .08, *SE* = .05, 95% CI [-.01, .18]).

**General Discussion**

The human mind evolved in a natural environment (Barkow et al., 1992; Buss, 2000; Sedikides et al., 2006). According to the biophilia hypothesis (Kellert & Wilson, 1995), humans have an inborn proclivity to affiliate with nature. This is a distal influence. The said proclivity is expressed proximally in preferences for engagement with a natural environment rather than a built environment (Mangone et al., 2017; Ulrich, 1981; Zhu & Xu, 2021), and in spending time in nature (Chen et al., 2018; Kellert et al., 2017).

What might account for people’s attraction to nature? We postulated that non-threatening environments constitute optimal fit for humans (Schmader & Sedikides, 2018). As such, people would feel more authentic when in a natural environment.

**Summary of Findings**

We obtained consistent support for this proposal (i.e., nature has a positive influence on authenticity) across 12 studies characterized by setting (field, laboratory), design (cross-sectional, experimental, longitudinal), methodology (different manipulations of nature and assessment of mediators and/or dependent measures), and cultural (university/community, East Asian/Western) diversity. In addition, we obtained a significant and medium-size effect of nature on authenticity via an internal meta-analysis of all quasi-experimental and experimental studies (Studies 2–6, 8–9, and 11).

Moreover, we specified plausible mechanisms through which nature is associated with, or fosters, authenticity. These were basic need satisfaction (Study 3), positive affect (Studies 4 and 7), self-esteem (Studies 5, 7–9, and 11), and mindfulness (Studies 6 and 7–9). Satisfaction of autonomy proved to be more potent than satisfaction of competence or relatedness (Study 3), and self-esteem emerged as the most powerful overall mechanism linking nature to authenticity (Study 7–9). Finally, we observed that exposure to nature (vs. control) improves PWB, contributing to increases in life satisfaction and meaning in life via self-esteem and authenticity (Studies 11 and 12), and both to increases in life satisfaction and meaning in life as well as decreases in depression, anxiety, and stress via authenticity (Study 12). The findings generalized across age and gender (Studies 1–12): We report re-analyses that include gender and age as control variables in Supplementary Materials (Tables 20S-29S). Also, the findings generalized across an index of socioeconomic status (i.e., monthly income; Study 1).

We approach the issue of mediation cautiously. Our mediational hypotheses were informed by our theoretical framework. Although the mediational tests placed the theory at risk (Anderson & Bushman, 1997; Fiedler et al., 2011), we interpret the findings as plausible rather than definitive (Maxwell & Cole, 2007; O’Laughlin et al., 2018). In particular, we tested alternative models, where applicable (see Footnotes and Supplementary Materials). In most cases (Studies 4–6, Studies 8–9, Study 11), the tested model had better fit that the alternative model(s), but in one case (Study 3) it did not do so, and in another case it had worse fit (Study 7). Furthermore, we found that self-esteem emerged as the stronger mediator of nature’s effect on authenticity, through an internal meta-analysis across experimental studies that included self-esteem as a mediator (Studies 5, 8, 9, and 11).

Finally, in an attempt to test directly its mediational status, we manipulated self-esteem and examined its causal impact on authenticity (Study 10). Self-esteem increased authenticity, thus reinforcing its conceptualization as mediator. Regardless, we acknowledge that the ordering of our variables (i.e., putative mediators) can be approached from alternative theoretical perspectives, and we hope that future research takes that extra step.

**Implications**

There is no consensus in the literature regarding the precursors of authenticity. However, we derived, theoretically and empirically, four likely candidates of the relation between nature and authenticity—basic need satisfaction, positive affect, self-esteem, mindfulness—and secured independent support for each.

Autonomy emerged as the most influential of the basic needs. This finding is consistent with the self-determination theory literature highlighting the relevance of autonomy (Lee et al., 2022; Weinstein et al., 2009) and with the attention restoration theory literature indicating that nature enables people to behave autonomously (Kaplan, 1995; Passmore & Howell, 2014). The finding is also consistent with literature characterizing the sense of power, a correlate of autonomy (Lammers et al., 2016), as a precursor of authenticity (Kifer et al., 2013; Kraus et al., 2011).

Self-esteem was the most potent of the mediators that we examined (followed by mindfulness). Overall, nature relates to authenticity through higher self-esteem or impacts on authenticity by raising one’s self-esteem. Self-esteem is a key ingredient of the self-concept (Alicke & Sedikides, 2009; [Greenwald](https://journals.sagepub.com/doi/abs/10.1177/0146167288141004) et al., 1988; Wood, 1991). As such, nature has implications for one’s self-concept, and in particular for self-concept positivity. Interestingly, authenticity is also enveloped in self-concept positivity. For example, authenticity is associated with positive or socially desirable characteristics (Fleeson & Wilt, 2010; Sheldon et al., 1997), and people regard their morally superior hypothetical behaviors (i.e., solutions to moral dilemmas) as more authentic. In addition, they construe their authentic self as good and moral (Christy et al., 2016; Newman et al., 2014) and as a guide to their moral behavior (Newman et al., 2015). Lastly, people believe that their authentic self is more positive and moral than others’ authentic selves (Zhang & Alicke, 2021) ), and their authenticity is raised when they receive positive feedback or visualizing a highly positive future self (Guenther et al., 2023). Self-esteem, then, and perhaps self-concept positivity, are particularly influential in connecting nature to authenticity.

We treated authenticity as a unitary construct and measured it in most studies (at the trait or state level) with the Authenticity Scale (Lenton, Slabu et al., 2013; Wood et al., 2008). This scale, though, consists of three factors: authentic living, low acceptance of external influence, and low self-alienation. In our analyses, we collapsed across these three factors. Study 10 reinforced our decision, showing that the Authenticity Scale produced converging results with the Southampton Authenticity Scale (Kelley et al., 2022). Nevertheless, we proceeded to re-analyzed data from all studies that had used the Authenticity Scale (Studies 1–6, 8–9, 11) separately for each factor. The results generally converged across factors (Tables 10S–19S, Supplementary Materials). Second, we obtained significant and medium-to-small effects sizes of nature on all of the three factors of authenticity through meta-analyses across the quasi-experimental and experimental studies (Studies 2–6, 8–9, and 11)

The findings have applicability. For example, nature engagement might elevate authenticity and consequently improve PWB among those with limited mobility (nursing home residents), persons who experience higher levels of stress or daily risk, and individuals in clinical therapy (Bratman et al. 2021; Grassini, 2022; Owens & Bunce, 2022) or living with psychopathology ([Tran](https://www.sciencedirect.com/science/article/pii/S266717432200009X#!) et al., 2022). More generally, the findings could inform policy-making and urban planning, with an emphasis on improving the quality of greenspace infrastructure in underprivileged areas (Wolch et al., 2014; Wyles et al., 2019).

**Directions for Future Research**

We examined, in part, effects of nature on PWB as mediated by authenticity. Future research might address whether authenticity transmits the influence on nature upon other domains such as physical health ([Jimenez](https://pubmed.ncbi.nlm.nih.gov/?term=Jimenez%20MP%5BAuthor%5D) et al., 2021; Turunen et al., 2023), prosociality (Castelo et al., 2021; Zhang et al., 2014), education (Kuo et al., 2021; Mann et al., 2022), or leadership effectiveness (Van Droffelaar et al., 2017, 2018). Alternatively or in addition, future research could examine whether authenticity carries the influence of nature on morality or ethical behavior (Kim et al., 2018; Zhang et al., 2019), reduced aggression (McCormick et al., 2015; Pinto et al., 2012), or work satisfaction and performance (Cable et al., 2013; Nübold et al., 2020).

Some authors suggested that nature’s PWB benefits might vary depending on

type of exposure (i.e., real nature vs. digital nature; White et al., 2017). We could not address this question, but addressed a similar one, namely, whether nature’s effect on authenticity varies as a function of type of exposure (i.e., real nature vs. digital nature). We found through internal meta-analyses that nature’s effects on authenticity, as well as the three factors of authenticity, did not vary across different nature exposure types.

The literature has also suggested that nature’s PWB benefits can vary depending on exposure frequency or length (Shanahan et al., 2016), patterns of contact with nature (Kahn et al., 2010), as well as environmental attributes such as landscape type (Wheeler et al., 2015), tree canopy density (Jiang et al., 2014), and biodiversity (Marselle et al., 2021). In Study 12, nature involvement (vs. control) manifested its influence on authenticity and PWB with some delay, that is, four weeks from onset. Future research may examine whether the abovementioned variables moderate the influence of nature on authenticity, especially via the currently identified mediators. There are other promising moderators, such as personality characteristics. For example, the nature-instigated, and authenticity-mediated, effects that we observed might be stronger for individuals high on anxiety (Tost et al., 2019) or loneliness (Vitalia, 2020), and low on narcissism (Womick et al., 2019).

Moreover, a focus on the restorative qualities of nature is promising (Menardo et al., 2021). For example, cyberostracism (i.e., experimental manipulations of exclusion via the Cyberball paradigm; Williams & Jarvis, 2006) decreases authenticity (Borawski, 2022) and so does objectification (i.e., being treated as an object for the attainment of others’ goals; Cheng et al., 2022). Nature may counter the influence of Cyberostracism and objectification, thus restoring authenticity.

**Limitations**

We conducted both cross-sectional Study 2 and quasi-experimental Study 3 in the field, and particularly in a park or a plaza. We collected data across conditions on the same days and times, and we employed the same randomly assigned research assistants. The parks and plazas appeared to be equally crowded, although we did not record the number of people present in each site. Generally, people in the parks were involved in leisure activities (e.g., walking, sitting), whereas people in the plazas were involved in shopping or walking. We cannot rule out the possibility of confounds pertinent to the testing sites. We addressed this possibility, however, in Study 3, an experiment in which we randomly assigned participants to the nature versus urban condition. Here, we replicated the findings of Studies 1–2 (as we did in Studies 4–6, 8–9, and 11).

In exit interviews (Study 12), participants in the nature condition remarked that they had watered their plant (without specifying how frequently) and had photographed it every second day. Participants in the control condition did not engage in an equivalent activity. However, we doubt that the results can be accounted for solely by this difference in conditions. Participants were students, living in dormitories and leading busy lives. We surmise that control condition participants would have found another, non-nature related activity (e.g., social media engagement) to fill up a time equivalent to occasional plant-watering and photographing a plant.

We conceptualized, operationalized, and focused on non-threatening nature. Of course, natural environments can also be threatening. For example, wilderness evokes more death-related cognitions compared to cultivated nature (Koole & Van den Berg, 2005), and exposure to untamed nature may have unfavorable well-being or health consequences (e.g., being poisoned by plants, stung by insects, or attacked by large mammals; Soga & Gaston, 2022). Threatening environments, then, place boundaries on our findings.

Researchers on the link between nature and PWB have raised the alarm, pointing out that most of the studies have included Western samples (Gallegos-Riofrío et al., 2022). We took steps at addressing this issue by testing mostly Chinese samples. Yet, the next empirical wave would need to sample from a broader pool of cultures.

We used cross-sectional, experimental, and longitudinal designs. Future research might add experience sample methodology (Huber et al., 2022) allowing the assessment of momentary variation of the influence of nature on authenticity and downstream consequences, and virtual reality (Chan et al., 2021) which may maximize the effects of nature. Also, we relied exclusively on self-report. Follow-up investigations could supplement self-report with neuropsychological, biomarkers of inflammation and stress, and physiological measures (Brown et al., 2013; Chang et al., 2020; Hunter et al., 2019; Shuda et al., 2020; Tost et al., 2019).

**Concluding Remarks**

Individuals report feeling authentic in familiar places (Lenton, Bruder et al., 2013), harmonious work environments or when led by authentic managers (Cha et al., 2019; Grandey et al., 2012), close relationships (Kraus & Chen, 2014; Wickham et al., 2018), online contexts (Hance et al., 2018), and while they are having fun (Lenton, Bruder et al., 2013). Here, we identified another source of authenticity: nature. It is linked to, or fosters, authenticity predominantly via self-esteem, and it has implications for PWB.

Nature, then, is important to the sense of feeling aligned with one’s real self and to wellness. These findings raise questions for the increasing trend toward urbanization and the accompanying environmental or mental health deterioration ([Blue](https://pubmed.ncbi.nlm.nih.gov/?term=Blue+I&cauthor_id=12291948) & [Harpham](https://pubmed.ncbi.nlm.nih.gov/?term=Harpham+T&cauthor_id=12291948), 1996; Kesebir, & Kesebir, 2017). Reconnecting with nature promises benefits for the self (i.e., higher authenticity) and wellness (i.e., PWB).

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**Supplementary Materials**

**Nature Nurtures Authenticity: Mechanisms and Consequences**

[STIMULUS MATERIALS 3](#_Toc3417)

[Study 1 3](#_Toc14084)

[Study 2 5](#_Toc8565)

[Study 3 6](#_Toc891)

[Study 4 7](#_Toc12876)

[Study 5 8](#_Toc15452)

[Study 6 9](#_Toc23308)

[Study 7 10](#_Toc1805)

[Study 8 15](#_Toc28363)

[Study 9 16](#_Toc10371)

[Study 10 17](#_Toc19444)

[Study 11 18](#_Toc17795)

[Study 12 19](#_Toc27677)

[ANCILLARY ANALYSES I. TESTING THE HYPOTHESIZED VERSUS ALTERNATIVE MODELS 22](#_Toc7008)

[ANCILLARY ANALYSES II. TESTING THE EFFECT OF NATURE ON THE THREE FACTORS OF THE AUTHENTICITY SCALE 31](#_Toc7124)

[ANCILLARY ANALYSES III. RE-ANALYSES INCLUDING GENDER AND AGE AS CONROL VARIABLES 41](#_Toc23473)

# STIMULUS MATERIALS

## Study 1

**Connectedness to Nature Scale** (Geng et al., 2015; Mayer & Frantz, 2004)

Please answer each of these questions in terms of the way you generally feel. There are no right or wrong answers. Please indicate your level of agreement with each of the following items on a 1 to 7 scale. (1= *strongly disagree*, 7 = *strongly agree*)

- I often feel a sense of oneness with the natural world around me.

- I think of the natural world as a community to which I belong.

- I recognize and appreciate the intelligence of other living organisms.

- I often feel disconnected from nature. (R)[[14]](#footnote-14)

- When I think of my life, I imagine myself to be part of a larger cyclical process of living.

- I often feel a kinship with animals and plants.

- I feel as though I belong to the Earth as equally as it belongs to me.

- I have a deep understanding of how my actions affect the natural world.

- I often feel part of the web of life.

- I feel that all inhabitants of Earth, human, and nonhuman, share a common ‘life force’.

- Like a tree can be part of a forest, I feel embedded within the broader natural world.

- When I think of my place on Earth, I consider myself to be a top member of a hierarchy that exists in nature. (R)

- I often feel like I am only a small part of the natural world around me, and that I am no more important than the grass on the ground or the birds in the trees.

- My personal welfare is independent of the welfare of the natural world. (R)

**Trait Authenticity Scale** (Wood et al., 2008)

Please indicate your level of agreement with each of the following items on a 1 to 7 scale. (1= *strongly disagree*, 7 = *strongly agree*)

- I think it is better to be yourself, than to be popular.

- I don’t know how I really feel inside. (R)

- I am strongly influenced by the opinions of others. (R)

- I usually do what other people tell me to do. (R)

- I always feel I need to do what others expect me to do. (R)

- Other people influence me greatly. (R)

- I feel as if I don’t know myself very well. (R)

- I always stand by what I believe in.

- I am true to myself in most situations.

- I feel out of touch with the ‘real me.’ (R)

- I live in accordance with my values and beliefs.

- I feel alienated from myself. (R)

**Demographics**

-Please indicate your gender (1 = male, 2 = female).

-Please write down your age.

-Please indicate your monthly income.

## Study 2

**State Authenticity Scale** (Wood et al., 2008)

Please answer each of these questions in terms of the way you feel right now. There are no right or wrong answers. Please report your level of agreement with each of the following items on a 1 to 7 scale, according to your present feelings. (1= *strongly disagree*, 7 = *strongly agree*)

- Right now, I think it is better to be yourself, than to be popular.

- Right now, I don’t know how I really feel inside. (R)

- Right now, I feel I will be strongly influenced by the opinions of others. (R)

- Right now, I am willing to do what other people tell me to do. (R)

- Right now, I feel I need to do what others expect me to do. (R)

- Right now, I feel that other people influence me greatly. (R)

- Right now, I feel as if I don’t know myself very well. (R)

- Right now, I feel I will stand by what I believe in.

- Right now, I am true to myself.

- Right now, I feel out of touch with the ‘real me.’ (R)

- Right now, I feel I live in accordance with my values and beliefs.

- Right now, I feel alienated from myself. (R)

**Demographics**

-Please indicate your gender (1 = male, 2 = female).

-Please write down your age.

## Study 3

**Basic Psychological Needs Scale** (Sheldon et al., 2001)

Please answer each of these questions in terms of the way you feel right now. There are no right or wrong answers. Please report your level of agreement with each of the following items on a 1 to 7 scale, according to your present feelings. (1= *strongly disagree*, 7 = *strongly agree*)

**Autonony Satisfaction**

- Right now, I feel that my choices were based on my true interests and values.

- Right now, I feel free to do things my own way.

**Competence Satisfaction**

- Right now, I feel that I was successfully completing difficult tasks and projects.

- Right now, I feel very capable in what I did

**Relatedness Satisfaction**

- Right now, I feel close and connected with other people who are important to me

- Right now, I feel a strong sense of intimacy with the people I spent time with.

**State Authenticity Scale** (Wood et al., 2008)

Same as in Study 2

**Demographics**

Same as in Study 2

## Study 4

**Positive and Negative Affect Scale** (Chinese version; Qiu et al., 2008)

How do you feel right now? Please report the extent to which you are currently experiencing each of the following states. (1 = *very slightly or not at all, 5 =extremely*)

- Active

- Enthusiastic

- Happy

- Elated

- Excited

- Proud

- Delighted

- Invigorating

- Grateful

- Ashamed

- Sad

- Afraid

- Nervous

- Scared

- Guilty

- Irritable

- Jittery

- Angry

**State Authenticity Scale** (Wood et al., 2008)

Same as in Study 1

**Demographics**

Same as in Study 2

Study 5

**Rosenberg (1965) Self-Esteem Scale (State Version)**

How do you feel right now? Please indicate the extent to which you are currently experiencing each of the following statements. (1 = *strongly disagree*,4 *= strongly agree*)

*-* Right now, I feel that I am a person of worth, at least on an equal plane with others.

- Right now, I feel that I have a number of good qualities.

- Right now, I am inclined to feel that I am a failure. (R)

- Right now, I feel I am able to do things as well as most other people.

- Right now, I feel I do not have much to be proud of. (R)

- Right now, I take a positive attitude toward myself.

- Right now, I am satisfied with myself.

- Right now, I wish I could have more respect for myself. (R)

- Right now, I feel useless. (R)

- Right now, I think I am no good at all. (R)

**State Authenticity Scale** (Wood et al., 2008)

Same as in Study 1

**Demographics**

Same as in Study 2

## Study 6

**Mindfulness Scale** (Lau et al., 2006)

We are interested in what you just experienced. Below is a list of things that people sometimes experience. Please report your level of agreement with each of the following items on a 1 to 7 scale, according to the feelings you experienced just now. (1 = *strongly disagree*, 7 = *strongly agree*)

- I was curious to see what my mind was up to from moment to moment. (C)

- I was curious about each of the thoughts and feelings that I was having. (C)

- I remained curious about the nature of each experience as it arose. (C)

- I was receptive to observing unpleasant thoughts and feelings without interfering with them. (D)

- I was more invested in just watching my experiences as they arose, than in figuring out what they could mean. (D)

- I approached each experience by trying to accept it, no matter whether it was pleasant or unpleasant. (D)

*Note*: C = Curiosity; D = Decentering

**State Authencity Scale** (Wood et al., 2008)

Same as in Study 1

**Demographics**

Same as in Study 2

## Study 7

**Connectedness to Nature Scale** (Geng et al., 2015; Mayer & Frantz, 2004)

Same as in Study 1

**Basic Psychological Need of Autonomy Subscale** (Sheldon et al., 2001)

Same as in Study 3

**Rosenberg Self-esteem Scale (Trait Version)** (Ji & Yu, 1999; Rosenberg, 1965)

The following scale consists of ten statements that you could possibly apply to you that you must rate on how much you agree with each on a 1 to 4 scale ((1= *strongly disagree*, 4 = *strongly agree*)). The items should be answered quickly without overthinking, your first inclination is what you should put down.

- I feel that I am a person of worth, at least on an equal plane with others.

- I feel that I have a number of good qualities.

- All in all, I am inclined to feel that I am a failure. (R)

- I am able to do things as well as most other people.

- I feel I do not have much to be proud of. (R)

- I take a positive attitude toward myself.

- On the whole, I am satisfied with myself.

- I wish I could have more respect for myself. (R)

- I certainly feel useless at times. (R)

- At times I think I am no good at all. (R)

**Scale of Positive and Negative Experience** (Diener et al., 2010; Tong & Wang, 2017)

Please think about what you GENERALLY do and experience. Then report how much you GENERALLY experience each of the following feelings by selecting a number from 1 = not at all to 7 = very strong.

- pleasant

- joy

- happy

- contended

- unpleasant

- sad

- angry

- afraid

**Mindful Attention Awareness Scale** (Brown & Ryan, 2003; Chen et al., 2012)

Please answer each of these questions in terms of the way you generally feel. There are no right or wrong answers. Please indicate your level of agreement with each of the following items on a 1 to 7 scale. (1= *strongly disagree*, 7 = *strongly agree*)

- I could be experiencing some emotion and not be conscious of it until some time later.

- I break or spill things because of carelessness, not paying attention, or thinking of something else.

- I find it difficult to stay focused on what’s happening in the present.

- I tend to walk quickly to get where I’m going without paying attention to what I experience along the way.

- I tend not to notice feelings of physical tension or discomfort until they really grab my attention.

- I forget a person’s name almost as soon as I’ve been told it for the first time.

- It seems I am “running on automatic” without much awareness of what I’m doing.

- I rush through activities without being really attentive to them.

- I get so focused on the goal I want to achieve that I lose touch with what I am doing right now to get there.

- I do jobs or tasks automatically, without being aware of what I’m doing.

- I find myself listening to someone with one ear, doing something else at the same time.

- I drive places on “automatic pilot” and then wonder why I went there.

- I find myself preoccupied with the future or the past.

- I find myself doing things without paying attention.

- I snack without being aware that I’m eating.

**The Authencity Inventory** (Kernis & Goldman, 2006)

***Instructions***: The following measure has a series of statements that involve people’s perceptions about themselves. There are not right or wrong responses, so please answer honestly. Respond to each statement by selecting the number from a seven-point scale (1 = *strongly disagree*, 7 = *strongly agree*), which you feel most accurately characterizes your response to the statement.

1. I am often confused about my feelings. (R)

2. I frequently pretend to enjoy something when in actuality I really don’t.

3. For better or for worse I am aware of who I truly am.

4. I understand why I believe the things I do about myself.

5. I want people with whom I am close to understand my strengths.

6. I actively try to understand which of my self-aspects fit together to form my core- or true-self.

7. I am very uncomfortable objectively considering my limitations and shortcomings. (R)

8. I’ve often used my silence or head-nodding to convey agreement with someone else’s statement or position even though I really disagree. (R)

9. I have a very good understanding of why I do the things I do.

10. I am willing to change myself for others if the reward is desirable enough. (R)

11. I find it easy to pretend to be something other than my true-self. (R)

12. I want people with whom I am close to understand my weaknesses.

13. I find it very difficult to critically assess myself. (R)

14. I am not in touch with my deepest thoughts and feelings. (R)

15. I make it a point to express to close others how much I truly care for them.

16. I tend to have difficulty accepting my personal faults, so I try to cast them in a more positive way. (R)

17. I tend to idealize close others rather than objectively see them as they truly are. (R)

18. If asked, people I am close to can accurately describe what kind of person I am.

19. I prefer to ignore my darkest thoughts and feelings. (R)

20. I am aware of when I am not being my true-self.

21. I am able to distinguish those self-aspects that are important to my core-or true-self from those that are unimportant.

22. People close to me would be shocked or surprised if they discovered what I keep inside me. (R)

23. It is important for me to understand my close others’ needs and desires.

24. I want close others to understand the real me rather than just my public persona or “image”.’

25. I try to act in a manner that is consistent with my personally held values, even if others criticize or reject me for doing so.

26. If a close other and I are in disagreement I would rather ignore the issue than constructively work it out. (R)

27. I’ve often done things that I don’t want to do merely not to disappoint people. (R)

28. I find that my behavior typically expresses my values.

29. I actively attempt to understand myself as best as possible.

30. I’d rather feel good about myself than objectively assess my personal limitations and shortcomings. (R)

31. I find that my behavior typically expresses my personal needs and desires.

32. I rarely if ever, put on a “false face” for others to see.

33. I spend a lot of energy pursuing goals that are very important to other people even though they are unimportant to me. (R)

34. I frequently am not in touch with what’s important to me. (R)

35. I try to block out any unpleasant feelings I might have about myself. (R)

36. I often question whether I really know what I want to accomplish in my lifetime. (R)

37. I often find that I am overly critical about myself. (R)

38. I am in touch with my motives and desires.

39. I often deny the validity of any compliments that I receive. (R)

40. In general, I place a good deal of importance on people I am close to understanding who I truly am.

41. I find it difficult to embrace and feel good about the things I have accomplished. (R)

42. If someone points out or focuses on one of my shortcomings I quickly try to block it out of my mind and forget it. (R)

43. The people I am close to can count on me being who I am regardless of what setting we are in.

44. My openness and honesty in close relationships are extremely important to me.

45. I am willing to endure negative consequences by expressing my true beliefs about things.

**Demographics**

Same as in Study 2

## Study 8

*Note*: The stem “Right now” preceded all measures.

**Mindfulness Scale** (Lau et al., 2006)

Same as in Study 6

**Positive and Negative Affect Scale** (Chinese version; Qiu et al., 2008)

Same as in Study 4

**Basic Psychological Need of Autonomy Subscale** (Sheldon et al., 2001)

Same as in Studies 3 and 7

**Rosenberg (1965) Self-Esteem Scale (State Version)**

Same as in Study 5

**State Authenticity Scale** (Wood et al., 2008)

Same as in Study 1

**Demographics**

Same as in Study 2

## Study 9

*Note*: The stem “Right now” preceded all measures.

**Mindfulness Scale** (Lau et al., 2006)

Same as in Studies 6 and 8

**Positive and Negative Affect Scale** (Watson e al., 1988)

Same as in Study 4

**Basic Psychological Need of Autonomy Subscale** (Sheldon et al., 2001)

Same as in Studies 3 and 7

**Rosenberg (1965) Self-Esteem Scale (State Version)**

Same as in Studies 5 and 8

**State Authenticity Scale** (Wood et al., 2008)

Same as in Study 1

**Demographics**

Same as in Study 2

## Study 10

**Rosenberg State Self-esteem Scale** (Rosenberg, 1965)

Same as in Studies 5, 8–9

**State Authenticity Scale** (Wood et al., 2008)

Same as in Study 1

**Southampton State Authenticity Scale** (Kelley et al., 2022)

The following statements refer to how you feel RIGHT NOW. Please indicate your agreement or disagreement with each statement by selecting the number that best corresponds to your level of agreement. The number should be anywhere from 1 to 7 (1= *strongly disagree*, 7 = *strongly agree*).

- Right now, I am feeling authentic.

- Right now, I feel true to myself.

- Right now, I feel like the real me.

- Right now, I feel genuine.

**Demographics**

Same as in Study 2

## Study 11

**Self-Esteem (**Rosenberg, 1965)

Same as in Studies 5, 8–10.

**Authenticity** Wood et al. (2008)

Same as in Studies 2–6, and 8.

**Satisfaction with Life Scale** (Diener et al., 1985).

Below are five statements with which you may agree or disagree. Indicate your agreement with each item by choosing the appropriate response. Please try to answer every question using a 1 to 7 scale over the past two weeks (1= *strongly disagree*, 7 = *strongly agree*) based on how feel right at this moment.

-Right now, I feel that in most ways my life is close to my ideal.

-Right now, I feel that the conditions of my life are excellent.

-Right now, I feel that I am satisfied with my life.

-Right now, I feel that, so far, I have gotten the important things I want in life.

-Right now, I feel that, if I could live my life over, I would change almost nothing.

**Presence of Meaning Subscale of the Meaning in Life Questionnaire** (Steger et al., 2006)

Please take a moment to think about what makes your life and existence feel important and significant to you. Please respond to the following statements as truthfully and accurately as you can and please remember that these are very subjective questions and that there are no right or wrong answers. Please indicate how you feel right at this moment. (1= *strongly disagree*, 7 = *strongly agree*)

-Right now, I feel like I understand my life’s meaning.

-Right now, I feel like my life has a clear sense of purpose.

-Right now, I feel like have a good sense of what makes my life meaningful.

-Right now, I feel like I have discovered a satisfying life purpose.

-Right now, I feel like my life has no clear purpose. (R)

## Study 12

**Trait Authencity Scale** (Wood et al., 2008)

Items are the same as in Study 2.

Instructions for Time 1 are the same as in Study 2

Instructions for Time 2 and 3: “Please indicate your level of agreement with each of the following items on a 1 to 7 scale, according to your general feelings over the past two weeks. (1= *strongly disagree*, 7 = *strongly agree*) ”

**Satisfaction with Life Scale** (Diener et al., 1985)

Below are five statements with which you may agree or disagree. Indicate your agreement with each item by choosing the appropriate response. Please try to answer every question using a 1 to 7 scale over the past two weeks (1= *strongly disagree*, 7 = *strongly agree*).

- In most ways my life is close to my ideal.

- The conditions of my life are excellent.

-  I am satisfied with my life.

- So far, I have gotten the important things I want in life.

- If I could live my life over, I would change almost nothing.

**Presence of Meaning Subscale of the Meaning in Life Questionnaire** (Steger et al., 2006)

Please take a moment to think about what makes your life and existence feel important and significant to you. Please respond to the following statements as truthfully and accurately as you can and please remember that these are very subjective questions and that there are no right or wrong answers. Please indicate how you have generally felt over the past two weeks on a 1 to 7 scale. (1= *strongly disagree*, 7 = *strongly agree*)

- I understand my life’s meaning.

- My life has a clear sense of purpose.

- I have a good sense of what makes my life meaningful.

- I have discovered a satisfying life purpose.

- My life has no clear purpose. (R)

**Depression Anxiety Stress Scales** (DASS; Lovibond & Lovibond, 1995)

Please read each statement and respond with 1, 2, 3 or 4 to indicate how much the statement applied to you over the past two weeks. There are no right or wrong answers. Do not spend too much time on any single statement. Please indicate how you typically felt over the past two weeks.

The rating scale is as follows:   
1 - Did not apply to me at all - NEVER  
2 - Applied to me to some degree, or some of the time - SOMETIMES  
3 - Applied to me to a considerable degree, or a good part of the time - OFTEN   
4 - Applied to me very much, or most of the time - ALMOST ALWAYS

- I found it hard to wind down. (Stress)

- I was aware of dryness of my mouth. (Anxiety)

- I couldn’t seem to experience any positive feeling at all. (Depression)

- I experienced breathing difficulty (e.g., excessively rapid breathing, breathlessness in the absence of physical exertion). (Anxiety)

- I found it difficult to work up the initiative to do things. (Depression)

- I tended to over-react to situations. (Stress)

- I experienced trembling (e.g., in the hands). (Anxiety)

- I felt that I was using a lot of nervous energy. (Stress)

- I was worried about situations in which I might panic and make a fool of myself. (Anxiety)

- I felt that I had nothing to look forward to. (Depression)

- I found myself getting agitated. (Stress)

- I found it difficult to relax. (Stress)

- I felt down-hearted and blue. (Depression)

- I was intolerant of anything that kept me from getting on with what I was doing. (Stress)

- I felt I was close to panic. (Anxiety)

- I was unable to become enthusiastic about anything. (Depression)

- I felt I wasn’t worth much as a person. (Depression)

- I felt that I was rather touchy. (Stress)

- I was aware of the action of my heart in the absence of physical exertion (e.g., sense of heart rate increase, heart missing a beat). (Anxiety)

- I felt scared without any good reason. (Anxiety)

- I felt that life was meaningless. (Depression)

**Demographics**

Same as in Study 2

# ANCILLARY ANALYSES I. TESTING THE HYPOTHESIZED VERSUS ALTERNATIVE MODELS

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| **Table 1S**  *Statistics for the Proposed (in Bold) and Alternate Mediation Models in Study 3* | | | | | | | |
|  | a path | b path | c path | c' path | R2 | SE | 95%CI |
| **condition→autonomy→authenticity** | **.40\*\*\*** | **.21\*\*\*** | **.24\*\*** | **.16 (*ns*)** | **.12** | **.03** | **.08**  **[.03, .16]** |
| condition→authenticity→autonomy | .24\***\*** | .43\*\*\* | .40**\*\***\* | .30**\*\*** | .13 | .04 | .10  [.04 .20] |
| **condition→competence→authenticity** | **.27\*** | **.14\*\*\*** | **.24\*\*** | **.20\*** | **.14** | **.08** | **.04**  **[.01, .10]** |
| condition→authenticity→competence | .24**\***\* | .38\*\*\* | .28\* | .19  (*ns*) | .07 | .08 | .09  [.03, .19] |
| **condition→relatedness→authenticity** | **.18**  **(*ns*)** | **.13\*\*\*** | **.24\*\*** | **.21\*\*** | **.07** | **.02** | **.02**  **[-.01, .07]** |
| condition→authenticity→relatedness | .24**\***\* | .33\*\*\* | .18  (*ns*) | .11 (*ns*) | .05 | .07 | .08  [.02, .17] |
| *Note*. \**p* < .05, \*\**p* < .01,\*\*\**p* < .001. *ns* = not significant. | | | | | | | |

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| **Table 2S**  *Statistics for the Proposed (in Bold) and Alternate Mediation Models in Study 4* | | | | | | | |
|  | a path | b path | c path | c' path | R2 | SE | Indirect effect  95%CI |
| **condition→positive affect→ authenticity** | **.32\*\*\*** | **.47\*\*\*** | **.29\*** | **.14**  **(*ns*)** | **.12** | **.05** | **.15**  **[.06, .28]** |
| condition→authenticity→ positive affect | .29\*\*\* | .21\*\*\* | .32\*\* | .26\*\* | .06 | .03 | .06  [.01, .14] |
| *Note*. \**p* < .05, \*\**p* < .01,\*\*\**p* < .001. *ns* = not significant | | | | | | | |

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| **Table 3S**  *Statistics for the Proposed (in Bold) and Alternate Mediation Models in Study 5* | | | | | | | |
|  | a path | b path | c path | c' path | R2 | SE | Indirect effect  95%CI |
| **condition→self-esteem →authenticity** | **.26\*** | **.38\*\*\*** | **.27\*\*** | **.17**  **(*ns*)** | **.22** | **.05** | **.10**  **[.02, .21]** |
| condition→authenticity  →self-esteem | .27\*\* | .49\*\*\* | .26\* | .13  (*ns*) | .21 | .06 | .13  [.04, .26] |
| *Note*. \**p* < .05, \*\**p* < .01,\*\*\**p* < .001. *ns* = not significant | | | | | | | |

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| **Table 4S**  *Statistics for the Proposed (in Bold) and Alternate Mediation Models in Study 6* | | | | | | | |
|  | a path | b path | c path | c' path | R2 | SE | Indirect effect  95%CI |
| **condition→mindfulness →authenticity** | **.17\*** | **.72\*\*\*** | **.19\*** | **.07**  **(*ns*)** | **.47** | **.05** | **.12**  **[.03, .24]** |
| condition→authenticity  →mindfulness | .19\* | .62\*\*\* | .17\* | .05  (*ns*) | .47 | .04 | .11  [.03, .21] |
| *Note*. \**p* < .05, \*\**p* < .01,\*\*\**p* < .001. *ns* = not significant | | | | | | | |

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| **Table 5S**  *Independent Mediation Analyses in Study 7* | | | | | | |
| Mediators | a path | b path | c path | c' path | SE | *ab*  95%CI |
| Autonomy Satisfaction | .59\*\*\* | .10\*\*\* | .36\*\*\* | .30\*\*\* | .007 | .06  [.05, .08] |
| Positive Affect | .56\*\*\* | .19\*\*\* | .36\*\*\* | .26\*\*\* | .008 | .11  [.09, .12] |
| Self-Esteem | .27\*\*\* | .46\*\*\* | .36\*\*\* | .24\*\*\* | .008 | .13  [.11, .14] |
| Mindfulness | .29\*\*\* | .25\*\*\* | .36\*\*\* | .29\*\*\* | .009 | .07  [.06, .09] |
| *Note*. \**p* < .05, \*\**p* < .01,\*\*\**p* < .001, the independent variable is nature connectedness, the dependent variable is trait authenticity | | | | | | |

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| **Table 6S**  *Statistics for the Proposed (in Bold) and Alternate Mediation Models in Study 7* | | | | | | | |
| Variables | a path | b path | c path | c' path | R2 | SE | Indirect effect 95%CI |
| **nature connectedness**  **→autonomy→authenticity** | **.59\*\*\*** | **.10\*\*\*** | **.36\*\*\*** | **.30\*\*\*** | **.37** | **.01** | **.06**  **[.05, .08]** |
| nature connectedness  →authenticity→autonomy | .36\*\*\* | .64\*\*\* | .59\*\*\* | .36\*\*\* | .23 | .03 | .23  [.18, .28] |
| **nature connectedness**  **→self-esteem→authenticity** | **.27\*\*\*** | **.46\*\*\*** | **.36\*\*\*** | **.24\*\*\*** | **.47** | **.01** | **.13**  **[.11, .15]** |
| nature connectedness  →authenticity→self-esteem | .36\*\*\* | .45\*\*\* | .27\*\*\* | .11\*\*\* | .38 | .01 | .17  [.15, .19] |
| *Note*. \**p* < .05, \*\**p* < .01,\*\*\**p* < .001. *ns* = not significant | | | | | | | |

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| **Table 7S**  *Statistics for the Proposed (in Bold) and Alternate Mediation Models in Study 8* | | | | | | | |
| Variables | a path | b path | c path | c' path | R2 | SE | Indirect effect 95%CI |
| **condition→autonomy→authenticity** | **.56\*\*\*** | **.19\*\*\*** | **.22\*\*** | **.11 (*ns*)** | **.14** | **.03** | **.11**  **[.05, .18]** |
| condition→authenticity→autonomy | .22\*\* | .61\*\*\* | .57\*\*\* | .43\*\* | .15 | .05 | .14  [.04, .25] |
| **condition→positive affect**  **→authenticity** | **.37\*\*\*** | **.52\*\*\*** | **.22\*\*** | **.03 (*ns*)** | **.16** | **.04** | **.19**  **[.13, .27]** |
| condition→authenticity  →positive affect | .22\*\* | .28\*\*\* | .37\*\*\* | .31\*\*\* | .23 | .02 | .06  [.02, .11] |
| **condition→self-esteem→authenticity** | **.17\*\*\*** | **1.12\*\*\*** | **.22\*\*** | **.04 (*ns*)** | **.38** | **.05** | **.19**  **[.10, .29]** |
| condition→authenticity→self-esteem | .22\*\* | .33\*\*\* | .17\*\*\* | .09\*\* | .39 | .02 | .07  [.03, .12] |
| **condition→mindfulness→authenticity** | **.42\*\*\*** | **.30\*\*\*** | **.22\*\*** | **.10 (*ns*)** | **.14** | **.03** | **.13**  **[.07, .21]** |
| condition→authenticity→mindfulness | .22\*\* | .41\*\*\* | .42\*\*\* | .33\*\*\* | .17 | .04 | .09  [.03, .17] |
| *Note*. \**p* < .05, \*\**p* < .01,\*\*\**p* < .001. *ns* = not significant | | | | | | | |

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| ***Table 8S***  *Statistics for the Proposed (in Bold) and Alternate Mediation Models in Study 9* | | | | | | | |
| Variables | a path | b path | c path | c' path | R2 | SE | Indirect effect 95%CI |
| **condition→autonomy**  **→authenticity** | **.24\*** | **.28\*\*\*** | **.25\*\*** | **.18\*** | **.14** | **.03** | **.07**  **[.01, .15]** |
| condition→authenticity→  autonomy | .25\*\* | .45\*\*\* | .24\* | .13  (*ns*) | .14 | .05 | .11  [.03, .22] |
| **condition→positive affect**  **→authenticity** | **.25\*\*\*** | **.80\*\*\*** | **.25\*\*** | **.05 (*ns*)** | **.21** | **.05** | **.20**  **[.11, .30]** |
| condition→authenticity  →positive affect | .25\*\* | .24\*\*\* | .25\*\*\* | .19\*\*\* | .24 | .02 | .06  [.02, .11] |
| **condition→self-esteem**  **→authenticity** | **.18\*\*** | **1.02\*\*\*** | **.25\*\*** | **.07 (*ns*)** | **.50** | **.07** | **.18**  **[.06, .31]** |
| condition→authenticity→  self-esteem | .25\*\* | .48\*\*\* | .18\*\* | .05 (*ns*) | .50 | .05 | .12  [.03, .21] |
| *Note*. \**p* < .05, \*\**p* < .01,\*\*\**p* < .001. *ns* = not significant | | | | | | | |

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| ***Table 9S***  *Statistics for the Proposed (in Bold) and Alternate Serial Mediation Models in Study 11* | | | | | | | | | | | |
|  | a1 path | d21 path | a2 path | b1 path | b2 path | c' path | R2 | SE | Indirect effect a1b1 95%CI | Indirect effect a2b2 95%CI | Indirect effect a1d21b2 95%CI |
| **condition → self-esteem → authenticity → life satisfaction** | **.11\*** | **1.28\*\*\*** | **.18\*** | **1.40\*\*\*** | **.40\*\*\*** | **.09 (*ns*)** | **.51** | **.09** | **.16**  **[.05, 29]** | **.07**  **[.02, .16]** | **.06**  **[.02, .13]** |
| condition → authenticity → self-esteem → life satisfaction | .32**\*\*\*** | .30**\*\*\*** | .02 (*ns*) | .40**\*\*\*** | 1.40**\*\*\*** | .09 (*ns*) | .51 | .09 | .13  [.04, .25] | .02  [-.06, .12] | .13  [.06, .24] |
| **condition → self-esteem → authenticity → meaning in life** | **.11\*** | **1.28\*\*\*** | **.18\*** | **.83\*\*\*** | **.77\*\*\*** | **-.09 (*ns*)** | **.67** | **.07** | **.09**  **[.03, .20]** | **.14**  **[.04, .28]** | **.11**  **[.03, .22]** |
| condition → authenticity → self-esteem → meaning in life | .32**\*\*\*** | .30**\*\*\*** | .02 (*ns*) | .77**\*\*\*** | .83**\*\*\*** | -.09 (*ns*) | .67 | .07 | .25  [.12, 44] | .01  [-.04, .06] | .08  [.03, .17] |
| *Note*. \**p* < .05, \*\**p* < .01,\*\*\**p* < .001. *ns* = not significant | | | | | | | | | | | |

# ANCILLARY ANALYSES II. TESTING THE EFFECT OF NATURE ON THE THREE FACTORS OF THE AUTHENTICITY SCALE

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| **Table 10S**  *Intercorrelations of Variables in Study 1* | | | | | |
|  | 1 | 2 | 2.1 | 2.2 | 2.3 |
| 1 Nature connectedness |  |  |  |  |  |
| 2 Authenticity | .32\*\*\* |  |  |  |  |
| 2.1 Authentic Living | .60\*\*\* | .45\*\*\* |  |  |  |
| 2.2 Acceptance of External Influence | .01 (*ns*) | -.78\*\*\* | .06\* |  |  |
| 2.3 Self-Alienation | -.16\*\*\* | -.88\*\*\* | -.14\*\*\* | .64\*\*\* |  |
| *M* (*SD*) | 4.77 (.85) | 4.43 (.91) | 5.21 (1.10) | 4.27 (1.28) | 3.64 (1.42) |
| ɑ | .82 | .84 | .81 | .86 | .88 |
| *Note*. \**p* < .05, \*\**p* < .01,\*\*\**p* < .001. *ns* = not significant. | | | | | |

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| **Table 11S**  *The Effect of Nature-Related Activity on Authenticity in Study 1* | | | | | |
| Variables | Planting indoor plants or not  *M* (*SD*) | |  |  |  |
| Yes  (*n* *=* 900) | No  (*n =* 279) | *t*(1177) | *p* | Cohen’s *d*  95% CI |
| Authenticity | 4.48 (.89) | 4.29 (.95) | 3.07 | .002 | .21  [.08, .35] |
| Authentic Living | 5.29 (1.04) | 4.93 (1.23) | 4.89 | .001 | .34  [.20, .47] |
| Acceptance of External Influence | 4.26 (1.25) | 2.30 (1.35) | -0.41 | .679 | -.03  [-.16, .11] |
| Self-Alienation | 3.60 (1.41) | 3.77 (1.46) | -1.76 | .079 | -.12  [-.26, .01] |

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| **Table 12S**  *The Effect of Nature on Authenticity in Study 2* | | | | | |
| Variables | Conditions  *M* (*SD*) | |  |  |  |
| Nature  (*n* *=* 133) | Urban  (*n =* 137) | *t*(268) | *p* | Cohen’s *d*  95% CI |
| Authenticity | 4.54 (.82) | 4.28 (.81) | 2.68 | .008 | .33  [.09, .57] |
| Authentic Living | 5.45 (1.00) | 5.17 (1.17) | 2.16 | .031 | .26  [.02, .50] |
| Acceptance of External Influence | 3.90 (1.10) | 4.14 (1.10) | -1.83 | .069 | -.22  [-.46, .02] |
| Self-Alienation | 3.92 (1.41) | 4.19 (1.38) | -1.57 | .118 | -.19  [-.43, .05] |

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| **Table 13S**  *The Effect of Nature on Authenticity in Study 3* | | | | | |
| Variables | Conditions  *M* (*SD*) | |  |  |  |
| Nature  (*n* *=* 160) | Urban  (*n =* 162) | *t*(320) | *p* | Cohen’s *d*  95% CI |
| Authenticity | 4.54 (.75) | 4.30 (.67) | 2.98 | .003 | .33  [.11, .55] |
| Authentic Living | 5.51 (.99) | 5.13 (1.00) | 3.49 | .001 | .39  [.17, .61] |
| Acceptance of External Influence | 4.05 (1.17) | 4.32 (1.00) | -2.25 | .025 | -.25  [-.47, -.03] |
| Self-Alienation | 3.78 (1.16) | 3.92 (1.12) | -1.08 | .282 | -.12  [-.34, .10] |

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| **Table 14S**  *The Effect of Nature on Authenticity in Study 4* | | | | | |
| Variables | Conditions  *M* (*SD*) | |  |  |  |
| Nature  (*n* *=* 85) | Urban  (*n =* 86) | *t*(169) | *p* | Cohen’s *d*  95% CI |
| Authenticity | 4.73 (.84) | 4.44 (.92) | 2.17 | .032 | .33  [.03, .63] |
| Authentic Living | 5.64 (.85) | 5.07 (.92) | 4.21 | .001 | .64  [.34, .95] |
| Acceptance of External Influence | 3.94 (1.09) | 4.14 (1.14) | -1.20 | .232 | -.18  [-.49, .12] |
| Self-Alienation | 3.52 (1.22) | 3.63 (1.26) | -0.55 | .583 | -.08  [-.39, .22] |

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| **Table 15S**  *The Effect of Nature on Authenticity in Study 5* | | | | | |
| Variables | Conditions  *M* (*SD*) | |  |  |  |
| Nature  (*n* *=* 82) | Urban  (*n =* 83) | *t*(163) | *p* | Cohen’s *d*  95% CI |
| Authenticity | 4.85 (.47) | 4.66 (.51) | 2.57 | .011 | .40  [.09, .71] |
| Authentic Living | 4.56 (.72) | 4.41 (.79) | 1.26 | .211 | .20  [-.11, .50] |
| Acceptance of External Influence | 2.99 (.60) | 3.24 (.69) | -2.580 | .011 | -.40  [-.71, -.09] |
| Self-Alienation | 2.46 (.87) | 2.77 (.88) | -2.26 | .025 | -.35  [-.66, .04] |

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| **Table 16S**  *The Effect of Nature on Authenticity in Study 6* | | | | | |
| Variables | Conditions  *M* (*SD*) | |  |  |  |
| Nature  (*n* *=* 81) | Urban  (*n =* 80) | *t*(159) | *p* | Cohen’s *d*  95% CI |
| Authenticity | 5.03 (.64) | 4.76 (.62) | 2.69 | .008 | .42  [.11, .74] |
| Authentic Living | 5.73 (.87) | 5.45 (.92) | 1.99 | .048 | .31  [.003, .63] |
| Acceptance of External Influence | 2.83 (1.02) | 3.37 (1.18) | -3.14 | .002 | -.49  [-.81, -.18] |
| Self-Alienation | 3.08 (1.04) | 3.28 (1.12) | -1.14 | .254 | -.18  [-.49, .13] |

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| **Table 17S**  *The Effect of Nature on Authenticity in Study 8* | | | | | |
| Variables | Conditions  *M* (*SD*) | |  |  |  |
| Nature  (*n* *=* 207) | Urban  (*n =* 209) | *t*(414) | *p* | Cohen’s *d*  95% CI |
| Authenticity | 4.76 (.75) | 4.54 (.82) | 2.91 | .004 | .29  [.09, .48] |
| Authentic Living | 5.46 (1.02) | 5.12 (1.02) | 3.41 | .001 | .33  [.14, .53] |
| Acceptance of External Influence | 3.88 (1.02) | 4.00 (.97) | -1.25 | .212 | -.12  [-.32, .07] |
| Self-Alienation | 3.30 (1.17) | 3.51 (1.33) | -1.68 | .093 | -.17  [-.36, .03] |

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| **Table 18S**  *The Effect of Nature on Authenticity in Study 9* | | | | | |
| Variables | Conditions  *M* (*SD*) | |  |  |  |
| Nature  (*n* *=* 204) | Urban  (*n =* 209) | *t*(411) | *p* | Cohen’s *d*  95% CI |
| Authenticity | 5.23 (.99) | 4.98 (.91) | 2.71 | .007 | .27  [.07, .46] |
| Authentic Living | 5.74 (.84) | 5.53 (.89) | 2.57 | .011 | .25  [.06, .45] |
| Acceptance of External Influence | 3.40 (1.19) | 3.15 (1.29) | -2.12 | .034 | -.21  [-.40, -.02] |
| Self-Alienation | 2.91 (1.45) | 3.19 (1.36) | -2.05 | .041 | -.20  [-.40, -.01] |

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| **Table 19S**  *The Effect of Nature on Authenticity in Study 11* | | | | | |
| Variables | Conditions  *M* (*SD*) | | *t*(298) | *p* | Cohen’s *d*  95% CI |
| Nature  (*n* *=* 147) | Urban  (*n =* 153) |
| Authenticity | 5.47 (.62) | 5.15 (.92) | 3.54 | .001 | .41  [.18, .64] |
| Authentic Living | 6.01 (.57) | 5.70 (.99) | 3.27 | .001 | .38  [.15, .61] |
| Acceptance of External Influence | 3.35 (.75) | 3.72 (.85) | -4.06 | .001 | -.47  [-.70, -.24] |
| Self-Alienation | 2.26 (.92) | 2.54 (1.26) | -2.25 | .025 | -.26  [-.49, -.03] |

# ANCILLARY ANALYSES III. RE-ANALYSES INCLUDING GENDER AND AGE AS CONROL VARIABLES

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| **Table 20S**  *Nature Engagement and Authenticity and Nature Connectedness in Study 1* | | | | | |
| Variables | Conditions  *M* (*SD*) | |  |  |  |
| Nature  (*n* *=* 855) | Urban  (*n =* 251) | *F*(1, 1101) | *p* | η²p  90% CI |
| Nature Connectedness | 4.86 (.80) | 4.48 (.95) | 36.02 | < .001 | .032  [.017, .051] |
| Authenticity | 4.49 (.90) | 4.30 (.98) | 4.22 | .040 | .004  [.000, .012] |
| Authentic Living | 5.30 (1.05) | 4.95 (1.21) | 15.22 | < .001 | .014  [.005, .027] |
| Acceptance of External Influence | 4.26 (1.26) | 4.30 (1.35) | .04 | .850 | .000  [.000, 002] |
| Self-Alienation | 3.58 (1.42) | 3.74 (1.45) | .60 | .437 | .001  [.000, .005] |
| *Note.* Gender, age, and monthly income were included as control variables. | | | | | |

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| **Table 21S**  *The Effect of Nature on Authenticity in Study 2* | | | | | |
| Variables | Conditions  *M* (*SD*) | | *F*(1, 266) | *p* | η²p  90% CI |
| Nature  (*n* *=* 133) | Urban  (*n =* 137) |
| Authenticity | 4.54 (.82) | 4.28 (.81) | 6.45 | .012 | .024  [.003, .062] |
| Authentic Living | 5.45 (1.00) | 5.16 (1.17) | 5.59 | .019 | .021  [.002, .057] |
| Acceptance of External Influence | 3.90 (1.10) | 4.14 (1.10) | 2.79 | .096 | .010  [.000, .040] |
| Self-Alienation | 3.92 (1.41) | 4.19 (1.38) | 1.66 | .199 | .006  [.000, .031] |

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| **Table 22S**  *The Effect of Nature on Variables Measured in Study 3* | | | | | |
| Variables | Conditions  *M* (*SD*) | | *F*(1, 318) | *p* | η²p  90% CI |
| Nature  (*n* *=* 160) | Urban  (*n =* 162) |
| Autonomy Satisfaction | 5.46 (1.05) | 5.06 (.99) | 13.81 | < .001 | .042  [.013, .083] |
| Competence Satisfaction | 5.10 (1.09) | 4.83 (1.22) | 4.61 | .033 | .014  [.001, .043] |
| Relatedness Satisfaction | 5.03 (1.17) | 4.84 (1.12) | 1.71 | .192 | .005  [.000, .027] |
| Authenticity | 4.54 (.75) | 4.30 (.67) | 11.25 | < .001 | .034  [.009, .073] |
| Authentic Living | 5.51 (.99) | 5.13 (1.00) | 14.03 | < .001 | .042  [.013, .084] |
| Acceptance of External Influence | 4.05 (1.17) | 4.32 (1.00) | 6.51 | .011 | .020  [.003, .053] |
| Self-Alienation | 3.78 (1.16) | 3.92 (1.12) | 2.01 | .157 | .006  [.000, .029] |

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| **Table 23S**  *The Effect of Nature on Variables Measured in Study 4* | | | | | |
| Variables | Conditions  *M* (*SD*) | | *F*(1, 167) | *p* | η²p  90% CI |
| Nature  (*n* *=* 85) | Urban  (*n =* 86) |
| Positive Affect | 3.76 (.54) | 3.44 (.62) | 13.01 | < .001 | .072  [.022, .143] |
| Authenticity | 4.73 (.84) | 4.44 (.92) | 4.61 | .033 | .027  [.001, .080] |
| Authentic Living | 5.64 (.85) | 5.07 (.92) | 17.27 | < .001 | .094  [.035, .169] |
| Acceptance of External Influence | 3.94 (1.09) | 4.14 (1.14) | 1.49 | .224 | .009  [.000, .047] |
| Self-Alienation | 3.52 (1.22) | 3.63 (1.26) | .26 | .608 | .002  [.000, .026] |

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| **Table 24S**  *The Effect of Nature on Variables Measured in Study 5* | | | | | |
| Variables | Conditions  *M* (*SD*) | | *F*(1, 161) | *p* | η²p  90% CI |
| Nature  (*n* *=* 82) | Urban  (*n =* 83) |
| Self-Esteem | 3.08 (.49) | 2.89 (.41) | 6.30 | .013 | .038  [.004, .97] |
| Authenticity | 4.85 (.47) | 4.66 (.51) | 6.27 | .013 | .037  [.004, .097] |
| Authentic Living | 4.56 (.72) | 4.41 (.79) | 1.31 | .254 | .008  [.000, .046] |
| Acceptance of External Influence | 2.99 (.60) | 3.24 (.69) | 6.15 | .014 | .037  [.004, .096] |
| Self-Alienation | 2.46 (.87) | 2.77 (.88) | 4.99 | .027 | .030  [.002, .086] |

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| **Table 25S**  *The Effect of Nature on Variables Measured in Study 6* | | | | | |
| Variables | Conditions  *M* (*SD*) | | *F*(1, 157) | *p* | η²p  90% CI |
| Nature  (*n* *=* 81) | Control  (*n =* 80) |
| Mindfulness | 5.31 (.70) | 5.05 (.73) | 5.43 | .021 | .033  [.003, .92] |
| Authenticity | 5.03 (.47) | 4.76 (.62) | 7.86 | .006 | .048  [.008, .113] |
| Authentic Living | 5.73 (.87) | 5.45 (.92) | 4.14 | .044 | .026  [.000, .080] |
| Acceptance of External Influence | 2.83 (1.02) | 3.37 (1.18) | 10.20 | .002 | .061  [.014, .131] |
| Self-Alienation | 3.08 (1.04) | 3.28 (1.12) | 1.48 | .226 | .009  [.000, .050] |

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| **Table 26S**  *The Effect of Nature on Variables Measured in Study 8* | | | | | |
| Variables | Conditions  *M* (*SD*) | | *F*(1, 412) | *p* | η²p  90% CI |
| Nature  (*n* *=* 207) | Urban  (*n =* 209) |
| Autonomy Satisfaction | 5.24 (1.31) | 4.68 (1.48) | 16.43 | < .001 | .038  [.014, .073] |
| Positive Affect | 3.78 (.54) | 3.41 (.62) | 38.61 | < .001 | .086  [.047, .131] |
| Self-Esteem | 3.07 (.39) | 2.91 (.45) | 13.73 | < .001 | .032  [.010, .065] |
| Mindfulness | 5.33 (.88) | 4.91 (.94) | 20.15 | < .001 | .047  [.019, .084] |
| Authenticity | 4.76 (.75) | 4.54 (.82) | 6.90 | .009 | .016  [.002, .043] |
| Authentic Living | 5.46 (1.02) | 5.12 (1.02) | 10.88 | .001 | .026  [.006, .056] |
| Acceptance of External Influence | 3.88 (1.02) | 4.00 (.97) | 1.26 | .262 | .003  [.000, .018] |
| Self-Alienation | 3.30 (1.17) | 3.51 (1.33) | 1.75 | .187 | .004  [.000, .021] |

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| **Table 27S**  *The Effect of Nature on Variables Measured in Study 9* | | | | | |
| Variables | Conditions  *M* (*SD*) | | *F*(1, 409) | *p* | η²p  90% CI |
| Nature  (*n* *=* 204) | Urban  (*n =* 209) |
| Autonomy Satisfaction | 5.63 (1.13) | 5.38 (1.26) | 4.40 | .011 | .011  [.000, .033] |
| Positive Affect | 3.71 (.52) | 3.46 (.52) | 23.87 | < .001 | .055  [.025, .095] |
| Self-Esteem | 3.08 (.62) | 2.90 (.67) | 7.51 | .006 | .018  [.003, .045] |
| Mindfulness | 4.74 (.94) | 4.60 (.90) | 2.60 | .108 | .006  [.000, .025] |
| Authenticity | 5.23 (.99) | 4.98 (.91) | 7.68 | .006 | .018  [.003, .046] |
| Authentic Living | 5.74 (.84) | 5.53 (.89) | 6.59 | .011 | .016  [.002, .042] |
| Acceptance of External Influence | 3.15 (1.29) | 3.40 (1.19) | 4.71 | .031 | .011  [.001, .034] |
| Self-Alienation | 2.91 (1.45) | 3.19 (1.36) | 4.26 | .040 | .010  [.000, .032] |

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| **Table 28S**  *The Effect of Nature on Variables Measured in Study 11* | | | | | |
| Variables | Conditions  *M* (*SD*) | | *F*(1, 296) | *p* | η²p  90% CI |
| Nature  (*n* *=* 147) | Urban  (*n =* 153) |
| Self-Esteem | 3.32 (.28) | 3.21 (.46) | 8.55 | .004 | .028  [.005, .066] |
| Authenticity | 5.47 (.62) | 5.15 (.92) | 14.55 | < .001 | .047  [.015, .092] |
| Authentic Living | 6.01 (.57) | 5.70 (.99) | 10.64 | .001 | .035  [.009, .076] |
| Acceptance of External Influence | 3.35 (.75) | 3.72 (.85) | 18.97 | < .001 | .060  [.024, .109] |
| Self-Alienation | 2.26 (.92) | 2.54 (1.26) | 6.90 | .009 | .023  [.003, .058] |
| Life Satisfaction | 5.30 (.96) | 4.93 (1.20) | 12.97 | < .001 | .042  [.012, .085] |
| Meaning in Life | 5.82 (.81) | 5.57 (1.21) | 7.03 | .008 | .023  [.003, .059] |

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| **Table 29S**  *The Effect of Nature on Variables Measured in Study 12* | | | | | |
| Variables | Conditions  *M* (*SD*) | | *F*(1, 122) | *p* | η²p  90% CI |
| Nature  (*n* *=* 58) | Urban  (*n =* 68) |
| Authenticity (T1) | 4.49 (.79) | 4.43 (.90) | .10 | .759 | .001  [.000, .026] |
| Authenticity (T2) | 4.57 (.86) | 4.46 (.83) | .37 | .546 | .003  [.000, .039] |
| Authenticity (T3) | 4.74 (.87) | 4.41 (.83) | 4.78 | .031 | .038  [.002, .108] |
| Life Satisfaction (T1) | 4.51 (1.10) | 4.48 (1.01) | .01 | .945 | .000  [.000, .002] |
| Life Satisfaction (T2) | 4.62 (1.16) | 4.35 (1.03) | 2.04 | .156 | .016  [.000, .072] |
| Life Satisfaction (T3) | 4.85 (1.16) | 4.48 (1.11) | 2.31 | .131 | .019  [.000, .076] |
| Meaning in Life (T1) | 4.99 (1.19) | 5.02 (1.10) | .22 | .637 | .002  [.000, .034] |
| Meaning in Life (T2) | 5.19 (1.13) | 4.92 (1.07) | .96 | .328 | .008  [.000, .054] |
| Meaning in Life (T3) | 5.32 (1.01) | 4.95 (.96) | 3.44 | .066 | .027  [.000, .092] |
| DASS (T1) | 1.66 (.39) | 1.68 (.39) | .01 | .915 | .000  [.000, .009] |
| DASS (T2) | 1.57 (.42) | 1.66 (.45) | 1.15 | .287 | .009  [.000, .057] |
| DASS (T3) | 1.47 (.41) | 1.68 (.44) | 5.91 | .016 | .046  [.005, .121] |
| *Note.* T = time; DASS = Depression Anxiety Stress Scale | | | | | |

1. In this, all other studies conducted on an online platform (i.e., Wenjuanxing, Credamo, Prolific: Studies 1, 7, 8, 9, 10, 11, 12), participants responded to an attention check (“This is an attention check question. Please select 7 = *strongly agree*.”) If participants failed the attention check, they were automatically excluded by the platform. [↑](#footnote-ref-1)
2. Demographic questions in all studies included age and gender. They also included monthly income in Study 1. Controlling for demographic attributes did not alter the results. [↑](#footnote-ref-2)
3. Participants high on engagement with nature-related activities (*M* = 4.86, *SD* = .79) reported stronger nature connectedness than their low counterparts (*M* = 4.47, *SD* = .95), *t*(1177) = 6.93, *p* < .001, Cohen’s *d* = .48, 95% CI [.34, 61]. [↑](#footnote-ref-3)
4. We also tested an alternative model, whether nature fulfilled basic psychological needs (i.e., autonomy and competence) through higher authenticity. The fitness of this alternative model was similar to the hypothesized one (Table 1S, Supplementary Materials). [↑](#footnote-ref-4)
5. We also tested an alternative model, whether nature increased positive affect by elevating authenticity. This alternative model yielded worse fit than the hypothesized one (Table 2S, Supplementary Materials). [↑](#footnote-ref-5)
6. The videos are available upon request. [↑](#footnote-ref-6)
7. We also tested an alternative model, whether nature increased self-esteem through authenticity. This alternative model yielded a similar fit to the hypothesized model (Table 3S, Supplementary Materials). [↑](#footnote-ref-7)
8. We tested an alternative model, whether nature enhanced mindfulness through authenticity. The alternative model yielded slightly worse fit than the hypothesized one (Table 4S, Supplementary Materials). [↑](#footnote-ref-8)
9. We also tested alternative models, whether nature connectedness predicted autonomy need satisfaction and self-esteem through authenticity, respectively. These alternative models yielded slightly better fit than the hypothesized ones (Table 6S, Supplementary Materials). [↑](#footnote-ref-9)
10. We also tested the alternative model for each mediator, as we did in Studies 3-7 (Table 7S, Supplementary Materials). All hypothesized models yielded better fitness than the alternative ones, except for condition → autonomy → authenticity. [↑](#footnote-ref-10)
11. Additionally, we tested the alternative model for each mediator. All hypothesized models yielded better fit than the alternative ones (Table 8S, Supplementary Materials). [↑](#footnote-ref-11)
12. We compared the fitness of the first hypothesized serial mediation model (condition → self-esteem → authenticity → life satisfaction) with an alternative mediation model (condition → authenticity → self-esteem → life satisfaction). The fitness of hypothesized serial mediation model was better than that of the alternative model (Table 9S, Supplementary Materials). We also compared the fitness of the second hypothesized serial mediation model (condition → self-esteem → authenticity → meaning in life) with an alternative mediation model (condition → authenticity → self-esteem → meaning in life). The fitness of hypothesized serial mediation model was better than that the alternative’s (Table 9S, Supplementary Materials). [↑](#footnote-ref-12)
13. We coded Studies 2–3 and 6 as 1, representing real nature. We coded Studies 4–5 and 8–10 as 0, representing digital nature. [↑](#footnote-ref-13)
14. Reverse-scored item [↑](#footnote-ref-14)