Primenjena psihologija
Vol. 16, No. 1, pp. 29-58, 2023

Research Article

Does nature work? Effects of workplace greenery on employee well-being

Boris Popov[1]✉, Snežana Popov[2] and Mojca Nastran[3]

[1] *Department of Psychology, Faculty of Philosophy, University of Novi Sad, Serbia*

[2] *Department of Biology and Ecology, Faculty of Science, University of Novi Sad, Serbia*

[3] *Department of Forestry and Renewable Forest Resources, Biotechnical Faculty, University of Ljubljana, Slovenia*

ABSTRACT

A significant number of studies have been conducted in order to explore the effects of greenery on various aspects of human functioning. However, little is known about how natural elements affect indicators of well-being at work, such as work burnout or work engagement. Two studies (Study 1, winter – Ljubljana, Slovenia; Study 2, spring – Novi Sad, Serbia) were performed in order to: 1) assess the effect of natural elements on work burnout and work engagement in two different seasons (winter and spring); 2) explore if gender moderates the effects of workplace greenery on work burnout and work engagement. The results from Study 1 (winter) showed that, after the exclusion of outliers from the dataset, neither indoor nor outdoor greenery had a significant effect on work engagement and work burnout. Contrary to this, in Study 2 (spring) outdoor greenery exerted a significant effect on both burnout and engagement, while indoor greenery did not. The moderating effect of gender was not clear and further studies on this topic are needed. Thus, the current research extends the existing literature on workplace greenery and demonstrates that natural elements can, to some extent, affect indicators of employee well-being, such as burnout and work engagement.

Keywords: natural elements, workplace greenery, employee well-being, job demands

UDC: 331.101.37
DOI: 10.19090/pp.v16i1.2409
Received: 17.05.2022.
Revised: 22.10.2022.
Accepted: 27.12.2022.

✉ Corresponding author e-mail: boris.popov@ff.uns.ac.rs

Introduction

Rapid urbanization together with the growing pressures of workplace demands has isolated humans from exposure to nature, making it harder to maintain a balanced lifestyle. Part of the solution for bringing nature back and integrating it into urban infrastructures is the careful planning and management of urban green resources. A significant number of studies have been conducted in order to explore the effects of natural elements on various aspects of human functioning, including postoperative recovery (Ulrich, 1984), students' preferences and perceived restoration likelihood (Bogerd et al., 2018), stress levels (Repke et al., 2018), to name just a few. Greenery is a valuable asset to the urban workplace environment as well, where it has been shown that natural stimuli such as indoor plants, nature walks and/or window views of outdoor greenery, have beneficial effects on employees in terms of reducing stress (Lottrup et al., 2013), improving mood (Barton et al., 2009), stress recovery (Ulrich et al., 1991) and psychophysiological status (Chang & Chen, 2005), increasing job satisfaction (Dravigne et al., 2008), health and well-being (Bowler et al., 2010; Elings, 2006; Houlden et al., 2017; Sanchez et al., 2018; Smith & Pitt, 2009; Wang et al., 2019), and even diminishing intention to quit (Leather et al., 1998). Moreover, attention and memory at work are also affected by the presence of a natural environment (Raanaas et al. 2011).

There are at least two theoretical explanations of why natural elements have positive effects on human functioning. One is the Attention Restoration Theory (ART; Kaplan & Kaplan, 1989) and it focuses on the cognitive processes that are involved in information processing. According to ART, directed attention is limited and prone to fatigue, while certain environments have restorative qualities that can facilitate attentional restoration. In line with ART, restoration is more likely to happen when an individual becomes fascinated with, and the attention is effortlessly drawn to an interesting element in the environment. One such environment is nature. The second is Stress Recovery Theory (SRT; Ulrich et al., 1991) and it explains the physiological and affective changes observed in natural environments.

According to SRT, nature speeds up physical recovery through muscle tension and reduces blood pressure and heart rate. Also, the natural environment promotes positive change in affect and emotions - all leading to the conclusion that nature can facilitate stress recovery via changes in the autonomic nervous system that increase relaxation.

Burnout and work engagement

To date several definitions, models, and concepts of burnout have been developed. One of the most popular concepts (Maslach et al., 2001) recognizes burnout as a syndrome which consists of three dimensions: (1) emotional exhaustion: the feeling of being "drained" and the inability to summon sufficient energy for a new day, as well as a lack of enthusiasm; (2) depersonalization/cynicism: the feeling of detachment from work and from the people in the work environment, distancing and taking on a cynical attitude, and (3) reduced personal accomplishment: feelings of decline in one's competence and productivity and a lowered sense of self-efficacy. Other conceptualizations of burnout put more emphasis on fatigue, exhaustion, and emotional weariness. For example, Pines and Aronson (1988) argue that burnout is a "state of physical, emotional and mental exhaustion, caused by long-term involvement in emotionally demanding situations" (p. 9). Similar to Pines and Aronson (1988), as well as Shirom (1989), Schaufeli and Greenglass (2001) define burnout as "a state of physical, emotional, and mental exhaustion that results from long-term involvement in work situations that are emotionally demanding" (p. 501). Under the influence of the positive psychology movement, a group of researchers have defined a new concept that has been viewed as a counterpart to that of burnout, and they have developed a new construct – work engagement (Maslach et al., 2001; Schaufeli et al., 2002; González-Romá et al., 2006). Work engagement is defined as a positive, fulfilling, work-related state of mind that is characterised by vigour, dedication, and absorption. Vigour refers to the high level of energy and resilience while working, the willingness of the employee to invest effort in his/her work and persistence in dealing with difficulties.

Dedication refers to the sense of significance, enthusiasm, inspiration, and pride. Absorption is characterized by being fully concentrated on one's work, whereby time passes quickly and the employee finds it difficult to detach him/herself from work. This definition of absorption makes it very similar to what Csikszentmihalyi (1990) once called "flow".

Mediating/moderating variables in the relationship between natural environment and human functioning

There are various possible ways and mediating variables by which natural green elements promote human functioning. For example, Zhang et al. (2014) found that connectedness with nature is associated with greater psychological well-being and is dependent on the tendency to perceive natural beauty. Also, a natural environment can provide a setting for an activity or exercise programme and thus promote increased physical activity, which in turn has a positive impact on health (Bowler et al., 2010). As gender differences in responsiveness to natural elements are well established (Lottrup et al., 2013), they are described in more detail.

Generally speaking, the literature mentions several gender differences with respect to their reactivity to natural elements (see for example, Jiang et al., 2014), although the results are not consistent in all studies (see Shin, 2007). For example, Lottrup et al. (2013) found that both physical and visual access to workplace greenery were associated with lower stress for men, while such association was not significant for women. Furthermore, Astell-Burt et al. (2014) conducted a longitudinal study in which they found that men benefitted from green spaces in early adulthood. However, no association between green spaces and mental health was evident for women until later in life. Older women in the greenest and least green neighbourhoods reported similar levels of general health, but those with a moderate degree of exposure had the most favourable mental health scores. Shibata & Suzuki (2002) carried out an experimental study in which participants were asked to perform two different tasks (sorting cards and

word associations) in three different working environments (front plant, side plant, no plant). It has been shown that in the association task, male subjects working without plants performed worse than female subjects under the same conditions. Moreover, the task performances of the male subjects using the front plant arrangement were higher than that of the male subjects working without plants. Jiang et al. (2014) have reported different patterns of relationship between males and females regarding tree density following a stress induction test in a laboratory experiment. For women, no relationship has been found between varying densities of tree cover and stress recovery. For men, the dose-response curve proved to be an inverted-U shape: as tree cover density increased from 1.7% to 24%, stress recovery increased. Tree density between 24% and 34% resulted in no change in stress recovery. Tree densities above 34% were associated with a decrease in recovery.

Finally, there are two additional constructs of interest for this study, for they have been proved to exert a significant effect on personal well-being. One is the *Engagement with natural beauty* - i.e., the degree to which individuals perceive natural beauty and are emotionally aroused by nature's beauty (Zhang et al., 2014). There is an emerging line of research that suggests a positive relation between individual's tendency to perceive natural beauty and well-being across different cultures (Diessner et al., 2008; Capaldi et al., 2017). The second one is *Job demands*, defined as "physical, social, or organizational aspects of the job that require sustained physical or mental effort and are therefore associated with certain physiological and psychological costs" (Demerouti et al., 2001, p. 501). The Job demands-resources model (see for example Schaufeli & Taris, 2014) assumes that when job demands are high, additional effort must be made to achieve the work goals and to prevent decreasing performance. This obviously comes with physical and psychological costs, such as fatigue, irritability, and burnout. Given the fact that both of those constructs have an established relationship with employee burnout, work engagement and well-being in general, we wanted to use them as covariates in order to "extract" the "pure" effect of greenery, regardless of the tendency of the person to perceive nature's beauty, or his/her level of job demands.

The present study

Although the links between urban greenery and employees' physical and psychological health have been summarised in many publications, there are still significant gaps in the knowledge and inconsistencies in the findings. For example, little is known about how natural elements affect indicators of well-being at work, such as burnout or work engagement. In fact, to the best of our knowledge, there are very few studies that have explored the effects of natural elements on burnout (Cordoza et al., 2018; Hyvönen et al., 2018; Thompson & Bruk-Lee, 2019). They demonstrated significant correlation between workplace nature exposure, directed attention, and strain outcomes (burnout, among others). Likewise, there is little information available regarding the seasonality of the effect of the workplace greenery. Does establishing green resources in the workplace affect employee well-being only during the spring – blooming season for most species – or can employees benefit throughout the whole year? Finally, many studies have yielded a weak association between natural elements and health (e.g., Houlden et al., 2017; see also Bringslimark et al., 2009) or have been criticised for having poor design, failing to exclude confounding effects or reverse causality (Lee & Maheswaran, 2011; see also Grinde & Patil, 2009; Yeo et al., 2020).

Our study addressed the above-mentioned gaps and raised the following research questions: 1) Does workplace greenery affect work burnout and work engagement, when job demands and engagement with natural beauty are controlled for? 2) Do the effects of workplace greenery on work burnout and work engagement differ across different seasons (winter vs spring) and samples (Ljubljana, Slovenia vs Novi Sad, Serbia)? 3) Does gender moderate the effects of workplace greenery on work burnout and work engagement?

In order to address those questions, we performed two independent studies, one in Ljubljana (Slovenia), and the second in Novi Sad (Serbia). In line with the Attention Restoration Theory and Stress Recovery Theory, and

building upon research findings that reveal restorative power of the natural elements and its effects on stress reduction (Hyvönen et al., 2018; Lottrup et al., 2013), following hypotheses were formulated:

H1: There are statistically significant differences in the levels of work burnout (WB) and work engagement (WE) with respect to the possibility of viewing a green outdoor environment through the window during work (WG1). We expect more work burnout and less engagement in employees lacking the possibility of viewing a green outdoor environment through the window during the working day.

H2: There are statistically significant differences in the levels of work burnout (WB) and work engagement (WE) with respect to the possibility of taking a break in a garden, park or other natural environment during the working day (WG2). We expect more work burnout and less engagement in employees having less possibility of taking a break in a garden, park or other natural environment during the working day.

H3: There are statistically significant differences in the levels of work burnout (WB) and work engagement (WE) regarding the presence/absence of workplace indoor plants (WG3). We expect more work burnout and less engagement in employees who work in offices without indoor plants.

Also, even though literature review did not paint the whole picture, most studies (Astell-Burt et al., 2014; Fischer et al., 2018; Jiang et al., 2014; Lottrup et al., 2013) showed that there are some gender differences in responding to urban greenery. Therefore, the fourth hypothesis was as follows:

H4: Male and female employees will respond differently in contact with both outdoor and indoor greenery.

Study 1 (Ljubljana, Slovenia)

Method

Instruments

The workplace greenery index (WGI) measures employees' nature exposure in the workplace. The questionnaire consists of three items, two of which have been taken from Lottrup et al. (2013), and the third has been added to measure the presence of indoor plants. The first item (WG1) measures the visibility of outdoor greenery through the window ("Do you have the possibility of viewing a green outdoor environment through the window while you are working?", with the response categories being "*Yes*" or "*No*"). The second question (WG2) relates to actual access to the outdoor environment during work ("Do you have the possibility of taking a break in a garden, park or other natural environment during your working day?", with the response categories being "*No*", "*Yes, but I never use it*", "*Yes, and I use it sometimes*", "*Yes, and I use it often*"). Finally, with the third question (WG3) participants were asked about the presence of indoor greenery in their workplaces ("Do you have indoor plants in your workplace?", the possible responses being "*Yes*" or "*No*").

The Work Burnout scale from the Copenhagen burnout inventory (Kristensen et al., 2005; Serbian version: Berat et al., 2016). WB assesses the degree of physical and mental fatigue and exhaustion that is perceived by the person, related to his/her work. It consists of seven items (e.g., "Is your work emotionally exhausting?"), with a five–point Likert scale (from "*Never/almost never*" to "*Always*"). The original scoring was used (the response "*Never/almost never*" is calculated as 0, "*Seldom*" as 25, "*Sometimes*" as 50, "*Often*" as 75 and "*Always*" as 100), and the total score is obtained as arithmetic means of the responses to all seven items. Earlier studies have shown that the scale is valid and reliable (Milfont et al., 2008). Verification on the samples of employees in Serbia has shown that it has a high internal consistency ($\alpha = .88$), as well as correlating to distress in the expected manner

(*r* = .54), turnover intentions (*r* ranging from .36 to .40) and job satisfaction (*r* ranging from .29 to -.44; Berat et al., 2016). The α coefficient obtained for the scale was .88 in Study 1 (Ljubljana), and .90 in Study 2 (Novi Sad), respectively.

WE was measured using the short version of *the Utrecht Work Engagement Scale* (UWES-9; Schaufeli et al., 2006; both Serbian and Slovenian versions of the scale can be obtained from: https://www.wilmarschaufeli.nl/tests/#engagement). The measure consists of three subscales: Vigor (VI), Dedication (DE), and Absorption (AB). Each scale consists of three items. Each item needs to be assessed on a 7-point scale (*1 = never* to *7 = always*). Item samples: "At my job, I feel strong and vigorous." (VI), "I am proud of the work that I do" (DE) and "I get carried away when I'm working" (AB). The α coefficient obtained in this study for the scale was .93.

The Job Demands Scale from the Job demands-resources questionnaire (Boyar et al., 2007), translated into Slovenian and adapted by Tement et al., (2010). The Job Demands Scale contains five items (sample item: "My work requires all of my attention"). The α coefficient obtained in this study for the scale was .89.

Appreciation of natural beauty was measured with the natural beauty dimension from the *Engagement with Beauty Scale* (EBS; Diessner et al., 2008). The scale measures the different psychological processes by which humans encounter beauty in the natural environment: perception or cognition ("I notice beauty in one or more aspects of nature"), physiological arousal ("When perceiving beauty in nature I feel changes in my body, such as a lump in my throat, an expansion in my chest, faster heartbeat, or other bodily responses"), conscious emotion ("When perceiving beauty in nature I feel emotional, it 'moves me,' such as feeling a sense of awe, or wonder or excitement or admiration or upliftment."), and transcendence or spirituality ("When perceiving beauty in nature I feel something like a spiritual experience, perhaps a sense of oneness, or being united with the universe, or a love of the entire world."). Each of the four items was assessed on a 7-point scale (*1 = very unlike me* to *7 = very much like me*). The α coefficient obtained in this study for the scale was .80.

Several items of socio-demographic data were collected as well, including gender, age, education level, tenure with current employer and the number of working hours per week.

Sample and procedure

The original idea behind the study was to implement a two-wave panel design, with a time lag of 4 months between Time 1 and Time 2. With that in mind, data for Time 1 were collected in January 2016. The invitation to participate in the survey was sent to five different departments of the public administration of the City of Ljubljana, whose offices are situated in the urban part of the city of Ljubljana. Participants were invited by their superiors via company email, were supplied with general information about the aim of the study, and informed that data obtained in the study would be considered strictly confidential and used only for research purposes. The questionnaires were administered individually, and it took the respondents approximately 10 minutes to complete them. Participation was anonymous and voluntary.

A total of 132 employees filled in a Google Form, out of approximately 300 full-time employees – response rate 43%. Two cases (1.5%) were initially deleted because they did not fill out at least one whole questionnaire, so the final sample consists of 130 respondents with usable data (38 males [29.2%], 92 females [70.8%]; average age 44 [range 27-66], 13 participants with no response), with nearly 42 working hours per week on average. 13 employees (10.2%) had finished secondary school, 100 employees had either bachelor's or master's degrees (78.1%), and 15 participants (11.7%) had either a magister degree or PhD (two participants with no response). Missing data were present in sparse numbers (all but one respondent with less than 10% missing data scattered across the dataset), so we decided to replace missing data using an Expectation-Maximisation algorithm.

Time 2 was carried out during the spring season, May-June 2016. However, due to attrition, at Time 2 data were collected from only 61 participants. In addition, a large number of participants did not use the same code for both measurements and thus data could not be reconciled.

Therefore, in this paper only data from Time 1 have been reported. However, data from Time 2 can be obtained from the first author upon request.

The SPSS 23.0 package was used to process the results. Descriptive statistics techniques were used to describe the data, and ANCOVA for testing the hypotheses.

Results

All variables in the study show a distribution that does not significantly deviate from normal. Also, α coefficients of internal consistency show acceptable levels for all the study variables. However, in two subjects' values were found for the work engagement which qualified them as outliers, namely z = 3.33 and 3.49 (Tabachnik & Fidell, 2013). Thus, Table 1 shows descriptive statistics for the variables used in the study, as well as their interrelationships, after the two outliers have been dropped.

Table 1

Study 1 - mean, standard deviation, skewness, kurtosis, and α coefficients of variable and correlations between the variables.

	M	*SD*	*Sk*	*K*	α	2	3	4
1. Work Burnout (WB)	42.24	22.04	.16	-.43	.88	-.43**	.22**	.05
2. Work Engagement (WE)	37.38	9.62	-.61	-.05	.95		.35**	.06
3. Job demands (JD)	20.68	3.79	-.90	.41	.89			.09
4. Engagement with Natural Beauty (EWNB)	18.52	4.60	-.77	.00	.83			

Notes. N = 128. M – mean, SD – standard deviation, Sk – Skewness, K – Kurtosis, α – coefficient of internal consistency.

* $p < .05$; ** $p < .01$

Table 2 shows the results of the ANCOVA analysis, where the three WG questions served as independent variables, burnout and work engagement as dependent variables, and job demands and engagement with natural beauty as covariates. Since dropping outliers from the dataset

significantly impacted results, Table 2 presents the ANCOVA results with and without outliers. As shown in Table 2, there were no significant differences in well-being indicators (burnout and work engagement) for either the window view (WG1) or the possibility of taking a break in a garden, park, or other natural environments during the working day (WG2). Thus, *hypotheses H1 and H2 were rejected*. There were significant differences in the level of work engagement in the case of the presence/absence of indoor plants at the workplace. It was shown that employees with indoor plants in their offices scored higher on work engagement (estimated M = 37.42, 95% *CI*: 35.83, 39.89; SE = 1.02) in comparison to those who did not (estimated M = 33.42, 95% *CI*: 29.70, 37.13; SE = 1.88). However, after two outliers had been removed, significant differences disappeared. Thus, *hypothesis H3 was rejected* as well. The fourth hypothesis was tested in the same way as the third, with gender introduced as the second categorical independent variable. Firstly, we wanted to test whether there were gender differences in burnout and work engagement. Results of t-test showed that there were no gender differences in either burnout, $t(126) = -0.28$, $p = .79$ or work engagement, $t(126) = -0.33$, $p = .74$. Furthermore, the results showed that gender moderated the effect of indoor plants on work engagement, WG3 x Gender, $F(1,124) = 4.07$, $p = .046$, $\eta^2 = .03$ while such an effect on burnout proved to be marginally significant, WG3 x Gender, $F(1,124)=3.71$, $p = .056$, $\eta^2=.03$. However, after two outliers had been removed from the dataset, significant differences disappeared for both engagement, WG3 x Gender, $F(1,122) = .33$, $p = .56$, $\eta^2 = .00$ and burnout, WG3 x Gender, $F(1,122) = 1.39$, $p = .24$, $\eta^2 = .01$. Thus, *hypothesis H4 was rejected*. Finally, further analysis revealed that women reported having indoor plants more frequently than men, $\chi^2(1) = 21.34$, $p = .00$, so the results regarding the moderation effect of gender in the relationship between indoor greenery and work engagement should be interpreted with caution.

Table 2

Study 1 - ANCOVA models testing differences in WB and WE with and without outliers

		With outliers (N = 130)					Without outliers (N = 128)				
Source	Dependent Variable	*df*	Error *df*	*F*	*p*	η^2	*df*	Error *df*	*F*	*p*	η^2
WG1	Work Burnout	1	126	.17	.68	.00	1	124	.01	.94	.00
	Work Engagement	1	126	.39	.54	.00	1	124	2.22	.14	.02
WG2	Work Burnout	3	124	1.05	.37	.03	3	122	1.20	.32	.03
	Work Engagement	3	124	1.14	.33	.03	3	122	1.78	.16	.04
WG3	Work Burnout	1	126	.01	.93	.00	1	124	.50	.48	.00
	Work Engagement	1	126	4.27	.04	.03	1	124	.97	.33	.01

Note. In the cases of all three WG variables, JD and EWNB served as covariates. JD was a significant covariate in the case of all three independent variables, whereas EWNB was not in any of the three. See text for more details.

Discussion

The results have shown that outdoor greenery (accessed either visually or physically) did not exert a significant effect on employee well-being as measured by burnout and work engagement. It is worth noting though that hypotheses regarding the effects of outdoor greenery were postulated based on the initial study design that should have included two measurements (winter/spring). However, due to the sample attrition, the results here were based only on the Time 1 measurement (winter). Given the fact that in wintertime outdoor greenery is scarce, this result is not surprising. Gender differences in the context of workplace greenery are also worthy of discussion. It appears that male and female workers react differently to the presence/absence of indoor plants. However, after two outliers were dropped from the dataset, the moderating effect of gender disappeared, thus rendering the results inconclusive. What is puzzling is the finding that women report having indoor plants in their offices more frequently than men. It appears that they choose to plant them for reasons other than restorative

(for example, aesthetic or out of cultural habit). Overall, there is insufficient data to support any of the formulated hypotheses and more research is needed on this topic.

Study 2 (Novi Sad, Serbia)

Method

Instruments

In Study 2, the instruments used to assess the presence/absence of greenery, engagement with natural beauty, work engagement and work burnout were the same as those used in Study 1.

The job characteristics questionnaire (Popov et al., 2022) was used to measure job demands. More specifically, three subscales measuring three fundamental job demands were used, those being: quantitative job demands (sample item: "Your job requires you to work very fast"), cognitive job demands (sample item: "Your job requires you to be very focused on and to pay full attention to the task at hand."), and emotional job demands (sample item: "Your job requires you to behave kindly (in conversation with customers, clients, etc.) even when you don't feel that way."). The dimensions were represented with three items each, so that the total number of items used in the study amounted to 9. The α coefficient obtained in this study for the scale was .64.

Sample and procedure

A total sample of 191 full-time employees from various industries (both private and public sector companies) participated in the study (101 females, 52.9%). The average age of participants at the time of the data collection was 37 (range 18-64). Average tenure for participants was 9 years, with 35 working hours per week on average. 42 employees (18.2%) had finished secondary school, 19 employees had bachelor's degrees (8.2%), 124 (53.7%) had master's degrees, and 5 participants had PhDs (2.2%).

Data was collected via Google Forms during May 2019. As was the case in Study 1, the first page of the questionnaire provided respondents with basic information on the main aim of the study. Respondents were informed that participation in the study was voluntary and were offered the opportunity to contact the authors. The questionnaires were completed individually and took the participants approximately 10 minutes to complete. Due to settings of Google Forms (all questions were obligatory to answer), there were no missing values or incomplete data.

Results

Table 3 shows descriptive values for the variables used in the study. It is evident that all variables show a fairly normal distribution. Also, the α coefficient of internal consistency is at least acceptable for all the variables except for job demands (JD), which evidenced a somewhat lower level of internal consistency. Given the fact that we used a composite score of job demands consisting of three relatively independent job demands indicators (quantitative, qualitative, and emotional), this result is not unexpected. No outliers were detected for any of the studied variables.

Table 3

Study 2 - mean, standard deviation, skewness, kurtosis, and α coefficients of variable and correlations between the variables

	M	*SD*	*Sk*	*K*	α	2	3	4
1. Work Burnout (WB)	47.88	24.79	.04	-.67	.90	-.52**	.39**	.17*
2. Work Engagement (WE)	34.77	10.14	-.46	-.05	.93		.00	.09
3. Job demands (JD)	32.61	5.22	-.18	-.13	.64			.19**
4. Engagement with Natural Beauty (EWNB)	13.81	3.96	-.39	-.42	.80			

Notes. $N = 191$. *M* – mean, *SD* – standard deviation, *Sk* – Skewness, *K* – Kurtosis, α – coefficient of internal consistency.

* $p < .05$; ** $p < .01$

Table 4 shows results of the ANCOVA analysis, where the three WG questions served as independent variables, burnout (WB) and work engagement (WE) as dependent variables, and job demands (JD) and engagement with natural beauty (EWNB) as covariates. As is shown in Table 4 and Figure 1, respondents with the possibility of viewing a green outdoor environment through their window during work (WG1) reported significantly less burnout (estimated *M* = 45.32, 95%*CI*: 47.49, 58.67, *SE* = 2.02), in comparison to those without that possibility (estimated *M* = 53.08, 95%*CI*: 47.49, 58.67, *SE* = 2.83). Also, respondents with the possibility of viewing a green outdoor environment through the window reported higher levels of WE (estimated *M* = 36.38, 95%*CI*: 34.62, 38.14; *SE* = .89), compared to those without (estimated *M* = 31.67, 95%*CI*: 29.21, 34.13; *SE* = 1.25). Thus, *hypothesis H1 was supported*. In the case of the possibility of taking a break in a garden, park, or other natural environments during the working day (WG2) the differences were also significant (Figure 2), thus *hypothesis H2 was supported*. Bonferroni pairwise comparisons showed significant differences in the level of burnout between the group of respondents who did not have access to outdoor greenery (estimated *M* = 55.27, 95%*CI*: 49.50, 61.04; *SE* = 2.92) as compared to both those who did have access and used it sometimes (estimated *M* = 43.80, 95%*CI*: 38.76, 48.85; *SE* = 2.56) and who did have access and used it often (estimated *M* = 41.00, 95%*CI*: 33.98, 48.02; *SE* = 3.56). Additionally, significant differences in the level of work engagement were registered between the group of respondents who did not have access to outdoor greenery (estimated *M* = 30.96, 95%*CI*: 28.37, 33.54; *SE* = 1.31) as compared to both those who had access and used it sometimes (estimated *M* = 36.26, 95%*CI*: 34.00, 38.52; *SE* = 1.15) and those who had access and used it often (estimated *M* = 37.08, 95%*CI*: 33.94, 40.23; *SE* = 1.59). Finally, there were no significant differences in levels of either WB or WE in the third condition (WG3 – "Do you have indoor plants at your workplace?"). Thus, *hypothesis H3 was rejected*. To test whether the effects of workplace greenery depend on gender, we performed additional analysis for the independent variables WG1 and WG2. Prior to the hypothesis testing, we wanted to examine whether

there were gender differences in burnout and work engagement. Results of t-test showed that there were no gender differences in burnout, *t*(189)= -1.33, *p* = .18 and work engagement, *t*(189)= .40, *p* = .69. Moderation analysis showed that gender did not moderate the relationship between either of the two greenery variables and employee well-being. In the case of the possibility of viewing green outdoors through the window: WG1 x Gender, *F*(1,185)= .87, *p* = .35, η^2 = .01 for work burnout; WG1 x Gender, *F*(1,185) = .81, *p* = .78, η^2 = .00 for WE. For the second independent variable, the possibility of taking a break in a garden, park or other natural environments during the working day: WG2 x Gender, *F*(3,181)= 1.79, *p* = .15, η^2 = .03 for work burnout, and WG2 x Gender, *F*(3,181) = 1.50, *p* = .22, η^2 = .02. Thus, *hypothesis H4 was rejected*.

Table 4

Study 2 - ANCOVA models testing differences in WB and WE

Source	Dependent Variable	*df*	Error *df*	*F*	*p*	η^2
WG1	Work Burnout	1	187	5.04	.03	.03
	Work Engagement	1	187	9.30	.00	.05
WG2	Work Burnout	3	185	5.00	.00	.08
	Work Engagement	3	185	4.13	.01	.06
WG3	Work Burnout	1	187	1.32	.25	.01
	Work Engagement	1	187	0.85	.36	.01

Notes. *N* = 191. In the cases of all three WG variables, JD and EWNB served as covariates. JD proved to be a significant covariate in the case of all three independent variables, but only when predicting WB. EWNB was not significant in any of the cases. See text for more details.

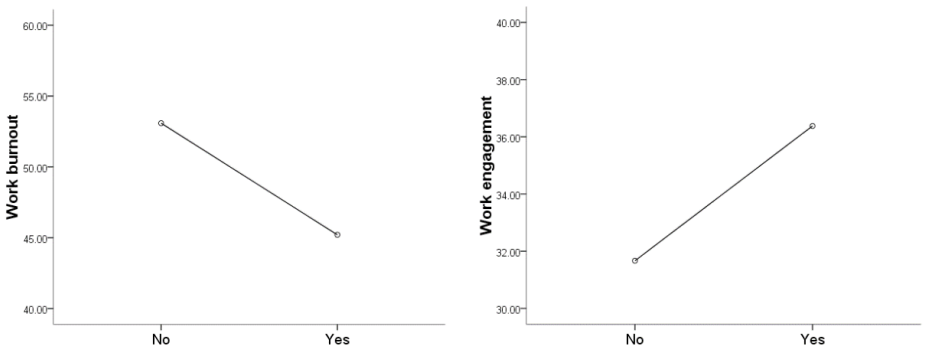

Figure 1. Main effect of WG1 ("Do you have the possibility of viewing a green outdoor environment through the window while you are working?") on Work burnout and Work engagement respectively

Figure 1. Main effect of WG1 on Work burnout and Work engagement.

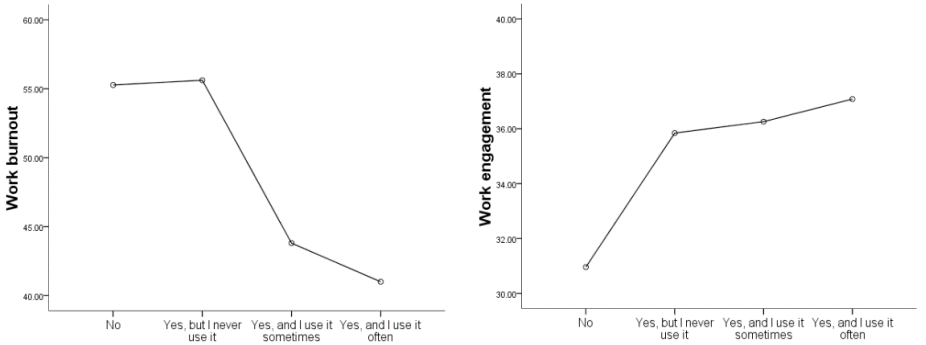

Figure 2. Main effect of WG2 ("Do you have the possibility of taking a break in a garden, park or other natural environments during your working day?") on Work burnout and Work engagement

Figure 2. Main effect of WG2 on Work burnout and Work engagement.

Discussion

It is interesting to notice the almost perfectly inverse pattern of results in the second study (Novi Sad, spring) in comparison to the first one (Ljubljana, winter). Specifically, the results of Study 2 have generally shown that outdoor natural elements can have restorative power and promote well-being in employees. In contrast, indoor plants were not found to be effective, nor did their interaction with gender have any influence on the well-being of employees. It can be concluded that, if available, outdoor greenery (the

possibility of visual and physical access) has a greater influence on the well-being of employees than indoor plants.

General discussion and conclusions

To date, many researchers have attempted to understand how people respond to the natural environment (Elings, 2006; Ulrich, 1984; see Lee & Maheswaran, 2011 for a detailed review). Even though they are not unambiguous in that regard, the results of previous research have generally shown that human beings tend to respond positively in contact with nature, in terms of affective response, psychological well-being, stress recovery etc. (Barton et al., 2009; Bowler et al., 2010; Elings, 2006; Houlden et al., 2017; Lottrup et al., 2013; Sanchez et al., 2018; Smith & Pitt, 2009; Wang et al., 2019). However, to date, very few studies have explored the effects of natural elements at work on employee well-being (Cordoza et al., 2018; Hyvönen et al., 2018; Thompson & Bruk-Lee, 2019). Moreover, to the best of our knowledge none of them have focused on the effect of greenery on one of the positive indicators of employee well-being, namely work engagement. To fill that gap in knowledge, we conducted two independent cross-sectional studies, the first in Ljubljana (Slovenia), and the second in Novi Sad (Serbia). The main aim of said studies was to explore whether workplace greenery affects employee well-being (both positive and negative aspects of well-being – work engagement and burnout, respectively), when job demands and engagement with natural beauty are controlled for.

There were several important findings. Firstly, it has been shown that when present, outdoor natural elements exert a significant effect on work burnout and engagement and that effect is in the expected direction. The same goes for both visual access (the possibility of viewing a green outdoor environment through a window), and physical access (the possibility of taking a break in a natural environment). As has been already discussed, this effect was significant only in the second study that was carried out in spring, and not in the first one, which took place during the winter season. Thus, it can be hypothesized that the effects of outdoor workplace greenery (both visual

and physical access) may be greater in spring than in winter, but the exact conclusion requires more strict research design (see Limitation section for more details). Furthermore, in the case of physical access to outdoor greenery during the working day, it is necessary to control for the possible confounding effect of physical exercise (i.e., walking), and thus to extract the "pure" effect of greenery. Indeed, it is possible that access to outdoor greenery during the working day boosts employees' physical activity, which in turn contributes to improving their well-being as shown earlier (see for example, Mitchell, 2013; Rebar et al., 2015; Weng & Chiang, 2014). That being said, the important finding of the current research is that the effect of making use of physical access to nature was significant in Study 2 (physical activity in a "greener" outdoor environment), while in Study 1 (physical activity in a "less green" environment) was not. This finding could contribute to the growing body of knowledge that considers greenery as being a key agent that boosts employee well-being.

The effect of indoor greenery is less clear. The results showed that, after two outliers had been removed in Study 1, indoor plants did not exert a significant effect on either burnout or engagement. It appears that, when present, outdoor natural elements have a greater effect on humans than indoor plants, as has been shown earlier (Chang & Chen, 2005; Korpela et al., 2017). One possible explanation is the confounding effect of depth of perception or daylight that enters the room through a window. For example, the classic work from Ulrich (1984) received criticism that the reported health benefits of looking through a hospital window was not due to natural elements but to the effects of a window regardless of the scenery. Yet, in later studies (Ulrich et al., 1991) it was shown that viewing a natural environment was superior in terms of physiological restoration after stressful events. However, when visual contact with both indoor and outdoor natural elements is present (as in Study 2), it is possible that depth perception (i.e., the view through the window onto the broader natural landscape or into the distance) may have more restorative power than a lack thereof (i.e., the view of "just" an indoor plant) and serve as the key component in boosting

employee well-being. Therefore, future studies should be focused on extracting the "true" effect of greenery.

It has been found previously that job stress affects male and female employees in different ways, as Lottrup et al. (2013) discussed in more detail. Additionally, in previous studies it has been shown that males and females react to exposure to nature differently (see for example, Astell-Burt et al., 2014; Shibata & Suzuki, 2002). The results from our studies do not support the hypothesis of gender as a moderating variable in the relationship between nature and employee well-being. Although women reported a greater number of plants in their offices as compared to men, there is no evidence that this greenery played a protective role in recovery from stress, nor that it helped in boosting work engagement. One way to understand such inconsistencies in findings in comparison to earlier studies is to take into account the different types of outcome measure. In different studies different indicators of response to the natural elements have been utilised (somatic outcomes, physiological response or reported perceptions of (mental) health levels; see for example Bos et al., 2016; Korpela et al., 2017), which makes it difficult to compare them.

Finally, the literature on environmental preference and restoration has to date been guided mostly by Stress Recovery Theory (Ulrich et al., 1991) and Attention Restoration Theory (Kaplan & Kaplan, 1989). This paper shows that theoretical perspectives for understanding workplace greenery could be broadened. Specifically, the results from this study could be discussed in the context of the job demands-resources theory (Demerouti et al., 2001), as suggested in one recent paper (Thompson & Bruk-Lee, 2019). In accordance with the job demands-resources theory, workplace greenery could be understood as one of the job resources that has restorative potential that is available to the employees to use (along with other work environment resources, such as ergonomically well-designed workplaces, social support, feedback, etc.). Naturally, a true and unambiguous support for the biophilia hypothesis is yet to be provided.

Limitations and implications for future research

The results of the study should be taken with some caution due to its limitations. *Firstly*, in Study 1 a relatively small number of employees took part in the study. Percentagewise, the response rate in the first wave was not small, given the fact that 130 out of (approximately) 300 full-time Ljubljana public administration employees took part in the study. However, in absolute numbers, it is still a relatively small sample. *Secondly*, as has been discussed earlier in the paper, two studies (Novi Sad and Ljubljana) were not carried out in the same period of the year. More precisely, Study 1 (Ljubljana) was designed as a short prospective study with two measurement times, but due to the high attrition in the second measurement, only data from measurement at Time 1 were usable. Therefore, the obtained results from the two studies are comparable only in the context of indoor greenery. Furthermore, the comparability of the two studies is further reduced due to the fact that they are two different samples (sample of employed from one public institution in study 1 vs heterogeneous sample of employees from various private companies in study 2). *Thirdly*, self-selection bias was not controlled for, and it cannot be ruled out a possibility that those who are most interested in this topic participated in the study and thus made the results biased in a sense that they reported an even greater effect of greenery than it would have been in the general population (see for example Bethlehem, 2010; Schaurer & Weiss, 2020).

Finally, we would like to invite other researchers to replicate this study particularly in other countries, as it would be very useful for establishing cross-cultural validity of the used measures and obtained results in general.

Conclusions

This study is among the first to examine the relationships between exposure to nature at work and employees' reported work burnout and work engagement. In general, the results give limited support to the growing body of evidence to suggest that natural elements can boost employee well-being

and mental health in general. It could be concluded that natural elements play a significant role in explaining employee well-being levels, even though that role is not always clear. Additionally, it seems that, when present, outdoor greenery exerts a greater impact on employee well-being than indoor plants. In the absence of outdoor elements (winter season in Study 1), results on the effect of indoor plants on work burnout and engagement are inconclusive. Finally, the moderating effect of gender is not clear and further studies on this topic are needed.

Conflict of interest

We have no conflicts of interest to disclose.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Funding

This work was supported by the GREEN SURGE, EU FP7 collaborative project, FP7-ENV.2013.6.2-5-603567.

References

Astell-Burt, T., Mitchell, R., & Hartig, T. (2014). The association between green space and mental health varies across the lifecourse. A longitudinal study. *Journal of epidemiology and community health*, *68*(6), 578–583. https://doi.org/10.1136/jech-2013-203767

Barton, J., Hine, R., & Pretty, J. (2009). The health benefits of walking in green spaces of high natural and heritage value. *Journal of Integrative Environmental Sciences*, *6*(4), 261–278. https://doi.org/10.1080/19438150903378425

Berat, N., Jelić, D., & Popov, B. (2016). Serbian version of the work burnout scale from the Copenhagen burnout inventory: Adaptation and psychometric properties. *Primenjena psihologija*, *9*(2), 177–198. https://doi.org/10.19090/pp.2016.2.177-198

Bethlehem, J. (2010). Selection bias in web surveys. *International statistical review, 78*(2), 161–188. https://doi.org/10.1111/j.1751-5823.2010.00112.x

Bogerd, N. van den, Dijkstra, S. C., Seidell, J. C., & Maas, J. (2018). Greenery in the university environment: Students' preferences and perceived restoration likelihood. *Plos one*, *13*(2), e0192429. https://doi.org/10.1371/journal.pone.0192429

Bos, E. H., Van der Meulen, L., Wichers, M., & Jeronimus, B. F. (2016). A Primrose Path? Moderating Effects of Age and Gender in the Association between Green Space and Mental Health. *International Journal of Environmental Research and Public Health*, *13*(5), 492–500. https://doi.org/10.3390/ijerph13050492

Bowler, D. E., Buyung-Ali, L. M., Knight, T. M., & Pullin, A. S. (2010). A systematic review of evidence for the added benefits to health of exposure to natural environments. *BMC Public Health*, *10*(1), 456–466. https://doi.org/10.1186/1471-2458-10-456

Boyar, S. L., Carr, J. C., Mosley, D. C., & Carson, C. M. (2007). The Development and Validation of Scores on Perceived Work and Family Demand Scales. *Educational and Psychological Measurement*, *67*(1), 100–115. https://doi.org/10.1177/0013164406288173

Bringslimark, T., Hartig, T., & Patil, G. G. (2009). The psychological benefits of indoor plants: A critical review of experimental literature. *Journal of Environmental Psychology*, *29*(4), 422–433. https://doi.org/10.1016/j.jenvp.2009.05.001

Capaldi, C. A., Passmore, H. A., Ishii, R., Chistopolskaya, K. A., Vowinckel, J., Nikolaev, E. L., & Semikin, G. I. (2017). Engaging with natural beauty may be related to well-being because it connects people to nature: Evidence from three cultures. *Ecopsychology*, *9*(4), 199–211. https://doi.org/10.1089/eco.2017.0008

Chang, C.-Y., & Chen, P.-K. (2005). Human Response to Window Views and Indoor Plants in the Workplace. *HortScience*, *40*(5), 1354–1359. https://doi.org/10.21273/HORTSCI.40.5.1354

Cordoza, M., Ulrich, R. S., Manulik, B. J., Gardiner, S. K., Fitzpatrick, P. S., Hazen, T. M., Mirka, A., & Perkins, R. S. (2018). Impact of Nurses Taking Daily Work Breaks in a Hospital Garden on Burnout. *American Journal of Critical Care*, *27*(6), 508–512. https://doi.org/10.4037/ajcc2018131

Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience*. New York: Harper & Row.

Demerouti, E., Bakker, A. B., Nachreiner, F., & Schaufeli, W. B. (2001). The job demands-resources model of burnout. *Journal of Applied Psychology, 86*(3), 499–512. https://doi.org/10.1037/0021-9010.86.3.499

Diessner, R., Solom, R. D., Frost, N. K., Parsons, L., & Davidson, J. (2008). Engagement With Beauty: Appreciating Natural, Artistic, and Moral Beauty. *The Journal of Psychology*, *142*(3), 303–332. https://doi.org/10.3200/JRLP.142.3.303-332

Dravigne, A., Waliczek, T. M., Lineberger, R. D., & Zajicek, J. M. (2008). The effect of live plants and window views of green spaces on employee perceptions of job satisfaction. *HortScience*, *43*(1), 183–187. https://doi.org/10.21273/HORTSCI.43.1.183

Elings, M. (2006). People-plant interaction: The physiological, psychological and sociological effects of plants on people. In J. Hassink & M. Van Dijk (Eds.), *Farming for health* (pp. 43–55). Springer, Netherlands. https://doi.org/10.1007/1-4020-4541-7_4

Fischer, L. K., Honold, J., Cvejić, R., Delshammar, T., Hilbert, S., Lafortezza, R., Nastran, M., Nielsen, A. B., Pintar, M., van der Jagt, A. P. N., & Kowarik, I. (2018). Beyond green: Broad support for biodiversity in multicultural European cities. *Global Environmental Change, 49*, 35–45. https://doi.org/10.1016/j.gloenvcha.2018.02.001

González-Romá, V., Schaufeli, W. B., Bakker, A. B., & Lloret, S. (2006). Burnout and work engagement: Independent factors or opposite poles? *Journal of Vocational Behavior*, *68*(1), 165–174. https://doi.org/10.1016/j.jvb.2005.01.003

Grinde, B., & Patil, G. G. (2009). Biophilia: Does Visual Contact with Nature Impact on Health and Well-Being? *International Journal of Environmental Research and Public Health*, *6*(9), 2332–2343. https://doi.org/10.3390/ijerph6092332

Houlden, V., Weich, S., & Jarvis, S. (2017). A cross-sectional analysis of green space prevalence and mental wellbeing in England. *BMC Public Health*, *17*(1), 460–469. https://doi.org/10.1186/s12889-017-4401-x

Hyvönen, K., Törnroos, K., Salonen, K., Korpela, K., Feldt, T., & Kinnunen, U. (2018). Profiles of Nature Exposure and Outdoor Activities Associated with Occupational Well-Being among Employees. *Frontiers in Psychology*, *9*(754), 1–13. https://www.frontiersin.org/article/10.3389/fpsyg.2018.00754

Jiang, B., Chang, C.-Y., & Sullivan, W. C. (2014). A dose of nature: Tree cover, stress reduction, and gender differences. *Landscape and Urban Planning*, *132*, 26–36. https://doi.org/10.1016/j.landurbplan.2014.08.005

Kaplan, R., & Kaplan, S. (1989). *The Experience of Nature: A Psychological Perspective*. Cambridge University Press.

Korpela, K., De Bloom, J., Sianoja, M., Pasanen, T., & Kinnunen, U. (2017). Nature at home and at work: Naturally good? Links between window views, indoor

plants, outdoor activities and employee well-being over one year. *Landscape and Urban Planning*, *160*, 38–47. https://doi.org/10.1016/j.landurbplan.2016.12.005

Kristensen, T. S., Borritz, M., Villadsen, E., & Christensen, K. B. (2005). The Copenhagen Burnout Inventory: A new tool for the assessment of burnout. *Work & Stress*, *19*(3), 192–207. https://doi.org/10.1080/02678370500297720

Leather, P., Pyrgas, M., Beale, D., & Lawrence, C. (1998). Windows in the Workplace Sunlight, View, and Occupational Stress. *Environment and Behavior*, *30*(6), 739–762. https://doi.org/10.1177/001391659803000601

Lee, A. C. K., & Maheswaran, R. (2011). The health benefits of urban green spaces: A review of the evidence. *Journal of Public Health*, *33*(2), 212–222. https://doi.org/10.1093/pubmed/fdq068

Lottrup, L., Grahn, P., & Stigsdotter, U. K. (2013). Workplace greenery and perceived level of stress: Benefits of access to a green outdoor environment at the workplace. *Landscape and Urban Planning*, *110*, 5–11. https://doi.org/10.1016/j.landurbplan.2012.09.002

Maslach, C., Schaufeli, W. B., & Leiter, M. P. (2001). Job Burnout. *Annual Review of Psychology*, *52*(1), 397–422. https://doi.org/10.1146/annurev.psych.52.1.397

Milfont, T. L., Denny, S., Ameratunga, S., Robinson, E., & Merry, S. (2008). Burnout and wellbeing: Testing the Copenhagen Burnout Inventory in New Zealand teachers. *Social Indicators Research*, *89*, 169–177. https://doi.org/10.1007/s11205-007-9229-9

Mitchell, R. (2013). Is physical activity in natural environments better for mental health than physical activity in other environments? *Social Science & Medicine*, *91*, 130–134. https://doi.org/10.1016/j.socscimed.2012.04.012

Pines, A., & Aronson, E. (1988). *Career burnout: Causes and cures*. New York: Free Press.

Popov, B., Jelić, D., Milinković, I., & Dinić, B. (2022). *Psychometric properties of the Job characteristics questionnaire*. *Manuscript in preparation*.

Raanaas, R. K., Evensen, K. H., Rich, D., Sjøstrøm, G., & Patil, G. (2011). Benefits of indoor plants on attention capacity in an office setting. *Journal of Environmental Psychology*, *31*(1), 99–105. https://doi.org/10.1016/j.jenvp.2010.11.005

Rebar, A. L., Stanton, R., Geard, D., Short, C., Duncan, M. J., & Vandelanotte, C. (2015). A meta-meta-analysis of the effect of physical activity on depression and

anxiety in non-clinical adult populations. *Health Psychology Review*, *9*(3), 366–378. https://doi.org/10.1080/17437199.2015.1022901

Repke, M. A., Berry, M. S., Conway, L. G., Metcalf, A., Hensen, R. M., & Phelan, C. (2018). How does nature exposure make people healthier? Evidence for the role of impulsivity and expanded space perception. *PLoS ONE*, *13*(8), e1–e20. https://doi.org/10.1371/journal.pone.0202246

Sanchez, J. A., Sanchez, S. V., Ikaga, T., Ichihara, M., & Harimoto, K. (2018). The impact of greenery and daylight on productivity and well-being at the workplace: An experimental case study. *Journal for Facility Management*, *1*(15), 20–32. https://doi.org/10.34749/jfm.2017.2647

Schaufeli, W. B., & Bakker, A. B. (2004). Job demands, job resources, and their relationship with burnout and engagement: A multi-sample study. *Journal of Organizational Behavior*, *25*(3), 293–315. https://doi.org/10.1002/job.248

Schaufeli, W. B., & Greenglass, E. R. (2001). Introduction to special issue on burnout and health. *Psychology & Health*, *16*(5), 501–510. https://doi.org/10.1080/08870440108405523

Schaufeli, W. B., & Taris, T. W. (2014). A critical review of the Job Demands-Resources Model: Implications for improving work and health. In G. Bauer & O. Hämmig (Eds.), *Bridging occupational, organizational and public health* (pp. 43–68). Dordrecht, the Netherlands: Springer. http://dx.doi.org 10.1007/978-94-007-5640-3_4

Schaufeli, W. B., Bakker, A. B., & Salanova, M. (2006). The measurement of work engagement with a Short Questionnaire: A cross-national study. *Educational and Psychological Measurement*, *66*(4), 701–716. https://doi.org/10.1177/0013164405282471

Schaufeli, W. B., Salanova, M., González-romá, V., & Bakker, A. B. (2002). The Measurement of Engagement and Burnout: A Two Sample Confirmatory Factor Analytic Approach. *Journal of Happiness Studies*, *3*(1), 71–92. https://doi.org/10.1023/A:1015630930326

Schaurer, I., & Weiß, B. (2020). Investigating selection bias of online surveys on coronavirus-related behavioral outcomes. *Survey Research Methods, 14*(2), 103–108. https://doi.org/10.18148/srm/2020.v14i2.7751

Shibata, S., & Suzuki, N. (2002). Effects of the foliage plant on task performance and mood. *Journal of Environmental Psychology*, *22*(3), 265–272. https://doi.org/10.1006/jevp.2002.0232

Shin, W. S. (2007). The influence of forest view through a window on job satisfaction and job stress. *Scandinavian Journal of Forest Research*, *22*(3), 248–253. https://doi.org/10.1080/02827580701262733

Shirom, A. (1989). Burnout in work organizations. In C. L. Cooper & I. Robertson (Eds.), *International Review of Industrial and Organizational Psychology* (pp. 26–48). New York: Wiley.

Smith, A., & Pitt, M. (2009). Sustainable workplaces: Improving staff health and well-being using plants. *Journal of Corporate Real Estate*, *11*(1), 52–63. https://doi.org/10.1108/14630010910940552

Tabachnick, B. G., & Fidell, L. S. (2013). *Using Multivariate Statistics (6th ed.)*. Boston, MA: Pearson.

Tement, S., Korunka, C., & Pfifer, A. (2010). Toward the assessment of the work–family interface: Validation of the Slovenian versions of work–family conflict and work–family enrichment scales. *Psihološka Obzorja*, *19*(3), 53–74.

Thompson, A., & Bruk-Lee, V. (2019). Naturally! Examining Nature's Role in Workplace Strain Reduction. *Occupational Health Science*, *3*(1), 23–43. https://doi.org/10.1007/s41542-019-00033-5

Ulrich, R. S. (1984). View through a window may influence recovery from surgery. *Science (New York, N.Y.)*, *224*(4647), 420–421. https://doi.org/10.1126/science.6143402

Ulrich, R.S., Simons, R. F., Losito, B. D., Fiorito, E., Miles, M. A., & Zelson, M. (1991). Stress recovery during exposure to natural and urban environments. *Journal of Environmental Psychology*, *11*(3), 201–230. https://doi.org/10.1016/S0272-4944(05)80184-7

United Nations, Department of Economic and Social Affairs, Population Division (2019). *World Urbanization Prospects: The 2018 Revision (ST/ESA/SER.A/420)*. New York: United Nations.

Wang, R., Helbich, M., Yao, Y., Zhang, J., Liu, P., Yuan, Y., & Liu, Y. (2019). Urban greenery and mental wellbeing in adults: Cross-sectional mediation analyses on multiple pathways across different greenery measures. *Environmental Research*, *176*, 108535. https://doi.org/10.1016/j.envres.2019.108535

Weng, P.-Y., & Chiang, Y.-C. (2014). Psychological Restoration through Indoor and Outdoor Leisure Activities.*Journal of Leisure Research*, *46*(2), 203–217. https://doi.org/10.1080/00222216.2014.11950320

Yeo, N. L., Elliott, L. R., Bethel, A., White, M. P., Dean, S. G., & Garside, R. (2020). Indoor Nature Interventions for Health and Wellbeing of Older Adults in Residential Settings: A Systematic Review. *The Gerontologist*, *60*(3), e184–e199. https://doi.org/10.1093/geront/gnz019

Zhang, J. W., Howell, R. T., & Iyer, R. (2014). Engagement with natural beauty moderates the positive relation between connectedness with nature and psychological well-being. *Journal of Environmental Psychology*, *38*, 55–63. https://doi.org/10.1016/j.jenvp.2013.12.013