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See or Be? Contact with nature and well-being during COVID-19 lockdown

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ABSTRACT

This study investigated how contact with nature benefitted well-being during a strict lockdown. The study took place in Israel during the last week of the first COVID-19 lockdown, when citizens were restricted to remain within 100 m of home. A survey company distributed questionnaires among 776 individuals. The questionnaires included demographic variables (gender, ethnic and cultural groups, age, income loss due to the pandemic), contact with nature variables (Nature near home, Nature viewed from home windows, and being in nature on the preceding day), and well-being measures (positive affect, negative affect, vitality, happiness, and stress). Before completing the well-being questionnaire, participants took part in an experiment that tested the effect of viewing nature images or urban images on well-being measures. The results showed that nature near home and nature viewed from the windows contributed to higher levels of well-being, and that being in nature on the preceding day was associated with higher levels of positive affect. These benefits emerged even among those who had been economically harmed by the pandemic. Viewing nature images was also associated with level of well-being, mainly to reduced level of stress and negative affect. The current findings extend the understanding of the benefits of access to nature during stressful times, particularly during emergencies when accessing remote nature is impossible. Furthermore, the findings highlight the dual effect of contact with nature on well-being: enhancement of positive affect together with reduction of negative affect and stress. The findings indicate that exposure to nature is much more valuable for women than for men. These findings are highly important in view of gender differences in pandemic’s impact on people’s well-being.

1. Introduction

During the COVID-19 pandemic, lockdowns were implemented worldwide to contain transmission of the virus. Policy measures included social distancing and self-isolation (Corley et al., 2021; Meagher & Cheadle, 2020; WHO, 2021). The worldwide stay-at-home orders affected many aspects of people’s lives, among them employment and income, culture and leisure, and meeting with family members and friends. One of the outcomes of the pandemic in general and of the stay-at-home restrictions in particular was impairment of psychological well-being. During the lockdown periods, individuals reported increased levels of insomnia, anxiety and depression, as well as fear instilled by the perceived health risks and economic consequences of the pandemic (Corley et al., 2021; Dzhambov et al., 2021; O’Connor et al., 2020). Exposure to ongoing and uncontrollable stress affects immune processes, influences susceptibility to and course of disease, and causes dysregulation in the neuroendocrine, metabolic, inflammatory, and cardiovascular systems (Cohen, Janicki-Deverts, & Miller, 2007; Cohen, Gianaros, & Manuck, 2016; O’Connor, Thayer, & Vedhara, 2021; Southwick, Bonanno, Masten, Panter-Brick, & Yehuda, 2014). Developing individual resilience during periods of exposure to ongoing stressful life events is therefore important for promoting individual well-being. Various physiological, psychological, social, and cultural factors interact to determine how an individual responds to stressful experiences (Southwick et al., 2014). In this paper, we focused on contact with nature, which is one way to resist stress and enhance well-being. Research has demonstrated the beneficial effects of contact with nature on human mental and physical health. Many natural features and environments were found to have a beneficial effect on human health, including urban nature features such as urban parks and street trees (Bratman, Hamilton, & Daily, 2012; Hartig, Mitchell, de Vries, & Frumkin, 2014). Given the benefits of contact with nature, exposure to nature may have been important for enhancing individuals’ well-being during the COVID-19 pandemic. However, the stay-at-home
restrictions limited people’s ability to spend time outdoors (Corley et al., 2021; Dzhambov et al., 2021). In this study, we aimed to examine whether the ways of contacting nature that remained available under stay-at-home restrictions can enhance well-being during a lockdown. The study took place in April 2020, in the last week of a five-week lockdown period in Israel. During this lockdown, stay-at-home orders restricted people to remain within 100 m of home. These restrictions reduced the ability of citizens to have contact with nature. We focused on three possible ways of maintaining contact with nature during the lockdown: the mere fact that nature was available close to home, nature viewed from home windows, and actually being in nature. In addition, we included an experimental design that tested the effect of watching nature images versus urban images via a home personal computer. For the well-being measurement, we focused both on positive affect and on negative affect and stress, as both are important when aiming to enhance resilience and well-being (Folkman & Moskowitz, 2000; Fredrickson, 1998).

1.1. The effects of positive affect, negative affect and stress on well-being

Positive affect and negative affect are two distinct and independent dimensions. Positive affect reflects the extent to which a person feels enthusiastic, active, and alert. High positive affect is a state of high energy, complete concentration, and pleasurable engagement (Watson, Clark, & Tellegen, 1988). Negative affect refers to subjective distress and pleasurable disengagement that entails aversive mood states, such as anger, contempt, fear, and nervousness (Watson et al., 1988). Negative affect may overwhelm the regulatory function of emotion, leading to impairment in endocrine and immune system functioning, which can result in increased risk for various health conditions, such as cardiovascular disease, and type 2 diabetes (Lopez & Denny, 2019). In contrast, positive affect triggers an upward spiral toward emotional well-being (Fredrickson, 1998; Fredrickson & Joiner, 2002) and leads to mental and physical health (Lyubomirsky, King, & Diener, 2005).

Accordingly, research in positive psychology has suggested that one of the important aspects of resilience is positive affect, which can have significant adaptive functions, under both normal and stressful conditions. Positive affect broadens an individual’s attentional focus and behavioral repertoire and consequently builds social, intellectual, and physical resources required to facilitate coping and adaptation to stress (Folkman & Moskowitz, 2000; Fredrickson, 1998; Israel-Cohen, Uzevovsky, Kashy-Rosenbaum, & Kaplan, 2015). Moreover, experiencing positive affect during stressful circumstances may interrupt the adverse effect of negative affect and prevent a decline into its negative outcomes (Folkman & Moskowitz, 2000; Fredrickson & Joiner, 2002; Fredrickson, Tugade, Waugh, & Larkin, 2003; Israel-Cohen et al., 2015). Following this rationale, research and practice in positive psychology have searched for strategies for enhancing positive affect that will consequently enhance well-being and resilience to stress. Studies have shown that positive psychology interventions can boost well-being and other psychological measures (Ghielen et al., 2017; Schutte & Malouf, 2019). The current study suggests another route of interventions that can be used to enhance positive affect and decrease negative affect and stress during stressful times: contact with nature. Contact with nature may serve as a means for enhancing resilience as it can reduce negative affect and stress as well as enhance positive affect, happiness, and vitality (Bratman et al., 2012; Hartig et al., 2014; McManus & Estes, 2015). During emergencies when access to nature is restricted, it is important to explore whether nature close to home, or viewed from home windows, and images of nature can help provide such benefits.

1.2. The potential benefits of contact with nature in and near home

Accessing remote outdoor natural environments is not always possible for people with mobility limitations, older people, people in healthcare facilities, residents of highly populated urban areas with no blue or green open spaces nearby, and even for families with young children, particularly during emergencies that dictate stay-at-home orders. Fortunately, various forms of contact with nature near or within the home have also been found to be beneficial to well-being (Dzhambov et al., 2021; Yeo et al., 2020).

1.2.1. Nature near home

While much of the research examining the restorative power of contact with nature focuses on remote nature such as national parks and forests, some research also highlights the beneficial impact of access to nature near home. Various forms of nature within cities, such as street trees and pocket parks, are beneficial for mental and physical health (Callaghan et al., 2020; Dobson et al., 2021; Hartig, Evans, Janzner, Davis, & Gärting, 2003). The amount of green space near home correlates with a higher level of happiness and lower levels of stress and anger (Berto, 2014; Bratman et al., 2012; Shanahan, Fuller, Bush, Lin, & Gaston, 2015). The benefits of nature near home to well-being are expressed both in short-term spikes in well-being and long-term expressions of physical and emotional well-being (Bratman, Daily, Levy, & Gross, 2015; Dobson et al., 2021). In other words, the impact of contact with nature remains even after the direct exposure is over. This finding is in line with the concept of “dose of nature” which suggests that the amount of time a person spends in nature has a cumulative impact on long-term mental and physical health (White et al., 2019).

Various mechanisms have been proposed to explain the benefits of urban nature for well-being. Some of them, including the restorative impact of nature on attention fatigue and restoration of cognitive capacities (Kaplan, 1995) and the reduction of psycho-physiological stress relative to restoration in the natural environment (Ulrich et al., 1991), are present in any natural environment. Others are more specific to urban environments, including improved air quality, support for social interactions, and reduction of stressors such as noise (Callaghan et al., 2020; Hartig et al., 2014). In addition, some of the beneficial effects of nature near home may be related to its non-use value, such that nature provides value even when people do not make actual use of nature. There may be several reasons for indirect (non-use) value, including the mere knowledge that nature can be reached whenever one desires and the appreciation of nature for its own sake (Esch et al., 2006). For example, WHO (2016) summarizes a variety of valuable effects of urban green spaces. Among many others, it was found that older adults living in inner-city neighborhoods benefit from the mere presence of green spaces around them and from the knowledge of their potential use, appears to promote social ties and a sense of community that is important for their health and well-being.

Most of the world’s population lives in cities (World Population Review, 2021), while in Israel, where this study took place, 92% of the population lives in cities (World Population Review, 2021). Urban lives are associated with decreased access to nature (Bratman et al., 2019). Furthermore, distribution of urban nature is related to income, and individuals living within economically poor urban areas have less access to urban nature, and urban parks (Lee & Maheswaran, 2011; Schwarz et al., 2015). In emergencies times when access to remoted nature is forbidden, studying the impact of access to near nature on well-being to is, therefore, crucial.

1.2.2. Nature viewed from windows

Viewing nature through windows provides an opportunity for contact with nature while being at home. Nature viewed from the windows enhances well-being in various settings, including at home (Kaplan, 2001) at the workplace (Kaplan, 1995; Lottropp, Stigsdotter, Meilby, & Claudi, 2015), and in the hospital (Ulrich, 1984). Natural elements (i.e., trees, forests, urban parks) that can be viewed from home windows contribute to residents’ satisfaction with their neighborhood and to their sense of well-being (R. Kaplan, 2001). Furthermore, nature seen from hospital windows has beneficial effects on speeding recovery or reducing needs for healthcare services after surgery (Ulrich, 1984). R.
Kaplan (2001) suggested that watching nature from windows provides an opportunity for fascination, draws upon effortless attention, and facilitates recovery from directed attention fatigue. According to Kaplan: “the glimpse of the world beyond afforded by the window view can quickly transport one elsewhere in mind if not in body” (Kaplan, 2001).

1.2.3. Nature images

Nature images have been extensively used in research on the restorative benefits of nature (e.g., Berto, 2005; North, Alalouch, & Hartig, 2011; White et al., 2010). Using nature images to evaluate the psychological benefits of exposure to nature has methodological advantages over research in ‘real’ outdoor nature, such as savings in time and effort (Hicks, Smith, Ralph, & Smilek, 2020). Furthermore, studying the restorative impact of nature images on well-being is also important for its own sake, as observing nature images can serve as a source of therapeutic intervention for people with accessibility limitations (Yeo et al., 2020), and have restorative potential in the presence of barriers to real nature (Hicks et al., 2020).

Two prominent research frameworks have been used to explain the restorative effect of exposure to nature: Kaplan’s attention restorative theory (Kaplan, 1995) and Ulrich’s stress reduction theory (Ulrich, 1984). Both stress the importance of visual representations of nature and can therefore explain the restorative effect of nature images (Kjellgren & Buhrkall, 2010). Research results on the impact of nature versus urban images on well-being are mixed. While some studies found that observing nature images is associated with faster recovery from stress (Van den Berg et al., 2015), and a higher level of attention capacity restoration as opposed to observing simulated urban environments (Berto, 2005; Kjellgren & Buhrkall, 2010), others did not find such an association (Hicks et al., 2020), or found differentiate patterns of impact. Berman, Jonides, and Kaplan (2008) found that watching nature images was associated with certain aspects of attention (i.e., executive attention), but not in others (i.e. alerting and orienting), and did not find an association with positive affect or negative affect (Berman et al., 2008). Brown, Barton, and Gladwell (2013) found that watching both nature images and urban images after stressor stimuli led to reduction in negative affect, but not to enhancement of positive affect, while Brooks, Otley, Arbuthnot, and Sevigny (2017) found a higher level of positive affect among participants who watched urban images comparing to those who watched nature images. Some studies also found inter-personal variations between individuals. For example, Cragie and colleagues (2015) found that exposure to nature images influenced sustained attention among typical individuals, but not among individuals with significant depressive symptoms.

These inconsistencies in research results might be related to variations in methodologies such as exposure duration, sample size, and images selection process (Hicks et al., 2020). Nonetheless, they also may be related to the different psychological processes that are involved while exposure to nature images comparing to real nature experience.

Exposure to nature images does not encompass all the advantages of actually being in nature and might lead to different patterns of restorative experience comparing to those of real nature. Observation is based only on a visual representation of nature rather than engaging other senses and on a two-dimensional image rather than on 360° vision. Observation also does not offer other possible mechanisms by which outdoor environments can enhance restoration, such as the ability to engage in physical activities and social interactions in nature (Yeo et al., 2020). Therefore, it seems reasonable to assume that although watching nature through images is beneficial, the effect of nature observation on psychological measures of well-being is lower than that of exposure to real nature. Only a few studies have addressed this issue. A study that compared the restorative effect of nature images with that of real nature on stress reduction found that while both environments facilitated stress reduction, the real natural environment elicited increased energy and a higher level of restoration than did the nature images (Kjellgren & Buhrkall, 2010). A meta-analysis study based on 31 studies (McMahan & Estes, 2015) led to similar conclusions: it was found that the effect sizes differed based on the type of exposure to nature, (i.e., actually being in a natural environment versus exposure to nature images) indicated a significantly larger average effect size for exposure to real nature compared to nature images (McMahan & Estes, 2015). Another study that investigated the impact of real nature versus nature images on positive affect and negative affect found that positive affect improved with actual nature contact, but not with nature images, and that negative affect decreased in both real nature and nature images conditions (Brooks et al., 2017). Overall, these results suggest that contact with real world nature is preferable to observing images and videos of nature, but when direct contact is not possible, virtual reality can be an alternative (White et al., 2018).

1.3. Mental health during lockdowns and well-being effects of contact with nature

The lockdown dictated by the COVID-19 pandemic had unintended consequences for individuals’ mental health (Corley et al., 2021; Dzhambov et al., 2021; O’Connor et al., 2020). As suggested in Section 1, given the benefits of contact with nature to well-being, exposure to nature might have served as an important means of enhancing individuals’ well-being during the COVID-19 pandemic, and particularly during lockdowns. Nevertheless, the lockdown restrictions also limited people’s access to natural areas that could have provided a restorative effect and enhanced mental and physical well-being (Dzhambov et al., 2021). Several studies have already addressed the benefits of contact with nature to well-being during the pandemic (Corley et al., 2021; Dzhambov et al., 2021; Pouso et al., 2020). Dzhambov et al. (2021) found an association between the relative abundance of greenery visible from home or in the neighborhood and reduced depression and anxiety among a sample of students a few weeks after the lockdown ended in Bulgaria. Crolely and colleagues (2021) found an association between garden usage and mental health among older adults in Scotland during the lockdown. In a survey conducted among participants in nine countries with different levels of lockdown severity (namely extent of permission to go outdoors), Pouso and colleagues (2021) found that lockdown severity significantly affected mental health, while contact with nature helped people cope with these effects, especially those under strict lockdown. These people perceived that nature helped them cope with lockdown measures. Moreover, those with accessible outdoor spaces and blue-green elements in their views reported more positive emotions (Pouso et al., 2020). Demographic differences also influenced the effect of lockdown on well-being, such that women had worse mental health outcomes and reported higher levels of depressive symptoms and anxiety than men. Younger adults reported higher levels of anxiety symptoms than older adults (O’Connor et al., 2020; Pouso et al., 2020).

1.4. The current study

This study contributes to previous research by focusing on several possible ways of maintaining contact with nature during lockdown restrictions, including both proximity to real nature (i.e., nature near home, nature from windows, and being in nature) and viewing nature images. The paper examines the effects of these varying types of contact with nature on several aspects of well-being.

As one of the undesirable outcomes of stay-at-home restrictions and social isolation is mental harm, it is important to understand how different factors affect emotional well-being. This study aimed to address this goal, focusing on how contact with real nature benefitted well-being during a strict lockdown. The second objective of this study was to investigate the possible impact of observing nature images on well-being during the lockdown. To control for the possible impact of watching images per se on well-being, the design included two conditions of watching images: watching nature images and watching urban
images.

We tested the following hypotheses:

**H1.** During lockdown, greater emotional well-being was associated with:

**H1a.** Nature near home

**H1b.** Nature viewed from a window

**H1c.** Being in nature

**H2.** During lockdown, observing nature images was associated with:

**H2a.** Greater level of well-being compared to observing urban nature images

**H2b.** Greater level of well-being compared to not observing any images

**H3.** During lockdown, contact with real nature (nature near home, nature from windows, being in nature) contributes more to emotional well-being than observing nature images. The study was conducted in April 2020, during the last week of the first lockdown period in Israel. According to the lockdown restrictions, the public was limited to remaining within 100 m from home. Any outdoor activity involving more than two people was allowed only if they lived in the same household. Therefore, access to nature was available only for those with nature of some sort within 100 m of home. In a country in which 92% of the population lives in cities, these restrictions highly limited access to green areas. Therefore, the present study focused on real nature possibilities which are in the public sphere, and can be reached within the restrictions, rather than nature accessible in the private sphere such as plants and private gardens.

2. Method

2.1. Research design

At the end of April 2020, a survey company distributed online questionnaires to 776 participants. The survey company founded an online access platform, counting over 50,000 active panel members aged 18 and up, representing the Jewish population in Israel. To better represent the population, a special quota was set, which was based on: 50% women, representative number of participants from different age groups, and a representative numbers of participants from different districts of the country. As the panel company did not have a representative number of Arab participants (a challenge that many panel companies had at the time of data collection for this study) the number of Arabs in the sample is not representative. The questionnaire included several demographic variables, including age, gender, cultural and ethnic group (Jewish/Arab), and the extent the pandemic affected participants’ income on a five-degree scale (between 1 = there is a significant loss to my income, and 5 = there is a significant improvement in my income). For data analysis the Economic loss measure was recoded into a dichotomic variable: experiencing/not experiencing a significant economic loss measure. For data analysis the Economic loss measure was recoded into a dichotomic variable: experiencing/not experiencing a significant economic loss measure. For data analysis the Economic loss measure was recoded into a dichotomic variable: experiencing/not experiencing a significant economic loss measure.

2.2. Measures

Measures included in this study were as followed:

2.2.1. Exposure to nature

Exposure to nature was assessed by three variables: Availability of nature within the 100 m allowed to access during the lockdown (hereafter will be referred as “Nature near home”), nature viewed from home windows (hereafter will be referred as “Nature from windows”) and being in nature on the proceeding day (hereafter will be refer as “being in nature”).

Nature near home was assessed by the following question: Does your place of residence allow access to nature or urban nature (e.g., public garden, beach, rural nature) within the distance allowed under the current restrictions? Possible answers to this question could be yes or no.

Being in nature was assessed by the following question:

Have you been in an area where there is nature in the last 24 h (e.g., garden, urban park, beach, open space within your place of residence)?

Possible answers to this question could be yes or no.

Nature from windows was assessed by the following five-degrees question:

What best describes the extent of nature (including distant nature such as mountains, urban park, trees, etc.) viewed from at list some of your home windows:

1. There is no vegetation or nature viewed from my home windows
2. There is very little nature viewed from my home windows
3. There is some nature viewed from my home windows
4. About half of the views from my home windows is of nature
5. Most of the view in my home windows is of nature or vegetation

The examples provided in the questions for possible contacts with nature served best to describe possible options of exposure and access to nature that are common in Israel.

2.2.2. Emotional well-being

The questionnaire included five types of emotional well-being measures.

**Stress.** Participants’ stress was examined using the Short State-Trait Anxiety Scale (STAI), originally developed in 1971 (Spielberger, 2010). The Short State-Anxiety Scale was published in 1992 and included six items (Marteka & Bekker, 1992). A psychometric examination of the short scale yielded values resembling those for the complete scale, and its internal reliability as measured by Cronbach’s alpha is 0.82. Cronbach’s alpha for the scale used in the current study was 0.86.

**Positive affect and negative affect.** Participants’ positive and negative affect were measured using the Positive Affect Negative Affect Schedule (PANAS) (Watson et al., 1988), which yields separate scores for positive and for negative affect. The Cronbach alpha internal reliability is 0.89 for the positive affect scale and 0.85 for the negative affect scale. In the current study, the Cronbach alpha is 0.86 for the positive affect scale and 0.89 for the negative affect scale.

**Happiness.** Happiness was examined by a single measure on which respondents were asked to indicate the degree of happiness they feel at the current moment on a scale ranging from 1 to 10. This measure is customarily used in studies examining the influence of nature on different measures of emotional well-being (Browning et al., 2020; Hartig, Mang, & Evans, 1991).

**Vitality.** Vitality was examined by a single item on which participants were asked the following question: “please indicate the degree of vitality you feel on a ten-point scale”.

2.2.3. Demographic variables

The questionnaire included several demographic variables, including age, gender, cultural and ethnic group (Jewish/Arab), and the extent the pandemic affected participants’ income on a five-degree scale (between 1 = there is a significant loss to my income, and 5 = there is a significant improvement in my income). For data analysis the Economic loss measure was recoded into a dichotomic variable: experiencing/not experiencing a significant economic loss measure. For data analysis the Economic loss measure was recoded into a dichotomic variable: experiencing/not experiencing a significant economic loss measure. For data analysis the Economic loss measure was recoded into a dichotomic variable: experiencing/not experiencing a significant economic loss measure.
experiencing economic loss. These variables were used to account for possible demographic confounds and to ensure between-group similarities in the experimental design.

2.3. Nature versus urban images experimental design

2.3.1. Images selection process

A basic condition in selecting the images for the study was uniformity of the nature and urban images, such that their impact on the participants, if found, would be dependent only on the content differentiating between them (nature vs. urban) and not on other aspects such as photo quality. Based on recommendations in the literature regarding uniformity of images used in comparative studies of what nature contributes to rehabilitation (Buijs, Elands, & Langers, 2009; White et al., 2010), the images in this study were chosen in three stages. The first stage entailed generating an initial pool of images. At this stage, the research team collected 50 urban and 50 nature images based on photographs taken by members of the research team or obtained from friends who consented to their use. The criteria for choosing images in this stage were as follows: (1) In order to make the images relevant to everyday life in Israel and to ensure uniformity, all images were of sites in Israel. (2) All the images were taken in daylight and clear weather conditions. (3) Distinguishing criterion: each image was exclusively of an urban scene or exclusively of a nature scene. (4) The images did not contain any prominent component that attracted attention, such as an extraordinary flower or an unusual building. (5) The images did not include human beings or animals. (6) The images did not include the sky except to emphasize what appeared on the ground: urban or nature. (7) Each image presented a typical urban scene or nature scene.

Based on image quality we then limited the pool to 30 urban and 30 nature images. In the last stage, the team members ranked all photos on a five-point scale ranging from very low to very high according to two criteria: (1) extent to which the photo represents Israeli nature or Israeli urban landscapes; (2) quality of the photography. The ten images with the highest average rankings in each category (urban/nature) were included in the final pool. (Figs. 1 and 2).

2.3.2. The experimental design

In constructing the manipulation, we sought to ensure uniformity in participants’ viewing and attention as well as to check that participants were watching the photos during the entire time they were shown. Hence, we constructed the photo exposure as follows: Participants viewed each image for 15 s and then had to answer three questions about the image that focused on (1) the extent to which they would like to be at the site where it was taken, (2) the extent to which they find the image soothing, and (3) the extent to which they liked the photos (all on a five-point scale ranging from 1 = not at all to 5 = very much). This strategy ensured that the participants would concentrate on the images. As participants had to answer many items after watching the images, to avoid fatigue, we have chosen to make the images session relatively short, and the participants were requested to answer the rather long questionnaire immediately after it. The overall time of exposure to the items was 2.5 min, not including time devoted to rating.

2.4. Statistical analysis

T-tests for independent samples were conducted for each of the variables: Nature near home, nature from windows, and being in nature,
to examine the differences in the average emotional well-being measures between those who had some contact with real nature and those who did not. To examine whether exposure to nature images influences emotional well-being, we conducted an analysis of variance (ANOVA) that compared the averages of the emotional well-being measures among the three research groups: exposure to nature images, exposure to urban images, and control group. The test included post-hoc tests with Tukey’s correction for multiple comparisons.

To compare attitudes toward the nature images and the urban images, we first calculated the means and standard deviations of the three evaluation items for the ten urban images and the ten nature images. Further, we conducted a T-test for independent samples to compare the averages of each of the three variables (affinity toward the image, assessment of the image as soothing, and desire to visit the image site).

To examine the unique contribution made by exposure to nature during the lockdown period to emotional well-being, we conducted multiple regression tests for each of the five dependent variables. In addition to the nature exposure variables, the regression also included the demographic variables: age, gender, cultural group (Jewish/Arab), and loss of economic status due to COVID-19 pandemic (defined as a dichotomic variable: yes/no). As a preliminary step in the regression analyses, we first conducted a correlation analysis that examined the associations between the various demographic variables and the emotional well-being variables. The analysis also examined how the nature exposure variables and the intervention variables (exposure to urban photos vs. nature photos) were associated with the emotional well-being variables.

3. Results

3.1. Sample description

A total of 776 survey questionnaires were completed online. Of these, 401 (51.7%) were completed by women and 62 (8%) by Arabs. The sample mean age was 42.10 (SD 15.76). Among the participants, 529 (68.2%) reported an intermediate or high level of economic loss caused by the pandemic (Table 1). The percentage of women was similar in all three research groups, as were the average age and the percentage of those reporting a decrease in their income.

The percentage of different forms of contact with nature in the three research groups are presented in Table 2.

The association between the research group and different types of exposure to nature was tested by chi-square test. Comparisons between the percentages were performed by Z-test with Bonferroni adjustment.
Table 2
Contact with nature characteristics of the survey sample.

| Research group | N | Nature near home (%) | Nature from windows (%) | Being in nature (%) |
|----------------|---|----------------------|------------------------|--------------------|
| Nature images  | 221 | 122 (58.9%)          | 113 (52.1%)            | 59 (26.7%)         |
| Urban images   | 217 | 137 (67.5%)          | 115 (53.7%)            | 71 (32.7%)         |
| Control        | 338 | 174 (55.1%)          | 152 (47.4%)            | 94 (27.8%)         |
| Overall        | 776 | 433 (55.6%)          | 380 (50.5%)            | 224 (28.9%)        |

* Only full questionnaires were included in the analysis.

Table 3
Levels of well-being measures and T statistics associated with nature near home.

| Nature near home | N | Mean | SD  | T statistic (df) | p-value | 95% Confidence Interval of the Difference | Cohen’s D |
|------------------|---|------|-----|-----------------|---------|-------------------------------------------|---------|
|                  |   |      |     |                 |         | Lower                                     |         |
| Positive affect  | No| 293  | 2.73| t(724) = −2.39  | 0.02    | −0.25 − 0.02                              | 0.18    |
|                  | Yes| 433  | 2.87|                 |         |                                           |         |
| Negative affect  | No| 293  | 1.95| t(724) = −3.92  | <0.001  | 0.11 − 0.32                               | 0.30    |
|                  | Yes| 433  | 1.73|                 |         |                                           |         |
| Happiness (1–10) | No| 293  | 6.63| t(724) = −1.30  | 0.20    | −0.50 − 0.10                              | 0.10    |
|                  | Yes| 433  | 6.83|                 |         |                                           |         |
| Vitality (1–10)  | No| 293  | 6.27| t(724) = −2.21  | 0.03    | −0.73 − 0.04                              | 0.17    |
|                  | Yes| 433  | 6.66|                 |         |                                           |         |
| Stress (1–4)     | No| 293  | 2.33| t(724) = −4.87  | <0.001  | 0.15 − 0.35                               | 0.39    |
|                  | Yes| 433  | 2.08|                 |         |                                           |         |

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Table 6 shows the descriptive statistics for participants’ emotional well-being measures and the T-tests for well-being statistics of the research groups. Results of the ANOVA analysis show that for positive affect, significant differences were found between the three groups (F2, 773 = 12.93, p < .001). Tukey’s post-hoc test shows that the average level of positive affect among the group that viewed the urban images (M = 2.60, SD = 0.83) was significantly lower than for the group that viewed the nature images (M = 2.85, SD = 0.79), as well as for the control (no images) group (M = 2.92, SD = 0.65). No significant difference was found between those that viewed the nature images and the control group (Fig. 3).

Regarding the negative affect variable, significant differences were found between the three groups (F2, 773 = 13.72, p < .001). Post-hoc tests show that the level of negative affect was significantly higher for the control group (M = 1.97, SD = 0.73) than for both the nature images group (M = 1.68, SD = 0.69) and the urban images group (M = 1.72, SD = 0.73). No significant difference was found between the nature images and the urban images groups (Fig. 4).

A significant difference was also found between the three groups on the stress measure average (F2, 773 = 3.596, p = .028). Post-hoc tests show that the level of stress was significantly lower (M = 2.07, SD = 0.69) for the nature images group than for the control group (M = 2.22, SD = 0.69). The level of stress was also lower for the nature images group than for the urban images group (M = 2.21, SD = 0.68), but the difference was not significant. No difference was found in stress level between the urban images group and the control group (Fig. 5).

For the variables of levels of happiness and vitality, no significant differences were found between the three groups.

Finally, a T-test for independent samples that compared participants’ evaluation of the images revealed that participants in the nature images group evaluated the nature images as more soothing, liked them more, and expressed a greater desire to visit the sites than those in the urban images group (Table 7).

Overall, the results partly supported hypothesis H2: Viewing nature images was related to higher levels of positive affect and to lower levels of stress compared to viewing urban images (H2a). Furthermore, the nature images were given significantly higher evaluations than the urban images on all three evaluation measures. Nevertheless, no significant difference was found between the two groups in negative affect, happiness or vitality.

Viewing nature images was significantly related to lower levels of stress and negative affect compared to not viewing images at all (H2b), but was not related to higher levels of positive affect, happiness, and vitality.

Yet, viewing urban images was also related to lower levels of negative affect compared to the control group. Hence, in this case the benefits for well-being were not exclusive to nature images.

3.3. Effect of exposure to nature images on emotional well-being
Table 4
Levels of well-being measures and T statistics associated with high versus low levels of nature from windows.

| Nature from windows | N   | Mean | SD  | T statistic (df) | p-value | 95% Confidence Interval of the Difference | Cohen’s D |
|---------------------|-----|------|-----|------------------|---------|------------------------------------------|-----------|
|                      |     |      |     |                  |         |                                          |           |
| Positive affect (1–5) |     |      |     |                  |         |                                          |           |
| Low                 | 372 | 2.72 | 0.76| t(750) = -2.69  | 0.007   | -0.26 – -0.04                           | 0.20      |
| High                | 380 | 2.87 | 0.76|                  |         |                                          |           |
| Negative affect (1–5) |     |      |     |                  |         |                                          |           |
| Low                 | 372 | 1.92 | 0.76| t(750) = -3.99  | <0.001  | 0.11 – 0.32                             | 0.29      |
| High                | 380 | 1.71 | 0.70|                  |         |                                          |           |
| Happiness (1–10)   |     |      |     |                  |         |                                          |           |
| Low                 | 372 | 6.46 | 2.13| t(743.12) = -3.45| <0.001  | -0.81 – -0.22                           | 0.25      |
| High                | 380 | 6.98 | 1.98|                  |         |                                          |           |
| Vitality (1–10)    |     |      |     |                  |         |                                          |           |
| Low                 | 372 | 6.21 | 2.41| t(739.17) = -3.42| <0.001  | -0.90 – -0.25                           | 0.25      |
| High                | 380 | 6.79 | 2.18|                  |         |                                          |           |
| Stress (1–4)       |     |      |     |                  |         |                                          |           |
| Low                 | 372 | 2.31 | 0.70| t(749) = 5.22   | <0.001  | 0.16 – 0.36                            | 0.38      |
| High                | 380 | 2.05 | 0.66|                  |         |                                          |           |

Table 5
Levels of well-being measures and T statistics associated with being in nature.

| Being in nature | N   | Mean | SD  | T statistic (df) | p-value | 95% Confidence Interval of the Difference | Cohen’s D |
|-----------------|-----|------|-----|------------------|---------|------------------------------------------|-----------|
| Positive affect (1–5) |     |      |     |                  |         |                                          |           |
| No              | 552 | 2.76 | 0.76| t(774) = -3.15  | 0.002   | -0.31 – -0.07                           | 0.25      |
| Yes             | 224 | 2.95 | 0.74|                  |         |                                          |           |
| Negative affect (1–5) |     |      |     |                  |         |                                          |           |
| No              | 552 | 1.83 | 0.75| t(774) = -0.79  | 0.429   | -0.07 – 0.16                           | 0.06      |
| Yes             | 224 | 1.79 | 0.69|                  |         |                                          |           |
| Happiness (1–10) |     |      |     |                  |         |                                          |           |
| No              | 552 | 6.67 | 2.05| t(774) = -1.03  | 0.302   | -0.49 – 0.15                           | 0.08      |
| Yes             | 224 | 6.83 | 2.07|                  |         |                                          |           |
| Vitality (1–10) |     |      |     |                  |         |                                          |           |
| No              | 552 | 6.39 | 2.36| t(448.43) = -1.82| 0.069   | -0.67 – 0.03                           | 0.14      |
| Yes             | 224 | 6.71 | 2.16|                  |         |                                          |           |
| Stress (1–4)    |     |      |     |                  |         |                                          |           |
| No              | 552 | 2.21 | 0.70| t(440.56) = 1.94| 0.053   | -0.00 – 0.21                           | 0.15      |
| Yes             | 224 | 2.10 | 0.65|                  |         |                                          |           |

Table 6
Attitudes toward nature-images versus urban-images.

| Research group      | N   | Mean | SD  | T (df)    | p-value | 95% Confidence Interval of the Difference | Cohen’s D |
|---------------------|-----|------|-----|-----------|---------|------------------------------------------|-----------|
|                     |     |      |     |           |         |                                          |           |
| Liked the photo (1–5) |     |      |     |           |         |                                          |           |
| Nature images       | 221 | 3.76 | 0.79| t(436) = 18.48| <0.001  | 1.22 – 1.50                           | 1.77      |
| Urban images        | 217 | 2.4  | 0.75|           |         |                                          |           |
| Find it soothing (1–5) |     |      |     |           |         |                                          |           |
| Nature images       | 221 | 3.68 | 0.77| t(436) = 20.46| <0.001  | 1.34 – 1.63                           | 1.96      |
| Urban images        | 217 | 2.2  | 0.75|           |         |                                          |           |
| Liked to be in the site (1–5) |       |      |     |           |         |                                          |           |
| Nature images       | 221 | 3.63 | 0.80| t(436) = 19.99| <0.001  | 1.34 – 1.63                           | 1.91      |
| Urban images        | 217 | 2.15 | 0.75|           |         |                                          |           |

Fig. 3. Mean and confidence interval of positive affect according to the exposure to images (95%).

Fig. 4. Mean and confidence interval of negative affect according to the exposure to images (95%).
Pearson correlations between exposure to nature variables and dependent variables.

Table 8 shows the Pearson correlations between the various demographic variables and the emotional well-being measures. The main demographic variables found to be associated with the study variables are age, gender, and economic loss. Older age was found to correlate with higher levels of positive affect, sense of vitality and sense of happiness and with lower levels of negative affect and stress. Women expressed higher negative affect and higher stress. Economic loss was found to correlate significantly with all the emotional well-being measures, such that those who experienced economic loss reported lower levels of positive affect, sense of vitality and sense of happiness and higher levels of negative affect and stress. Culture was not found to correlate with any of the emotional well-being measures. Considering these findings, only the demographic variables of age, gender and economic loss were used in the regression.

Table 9 shows the correlation analysis for the nature exposure variables, exposure to urban and nature images, and the emotional well-being measures. As shown, nature from the windows was significantly correlated with all the emotional well-being measures, such that the correlation coefficients of positive affect, sense of happiness and vitality were positive, while those of negative affect and stress were negative. A similar pattern emerged for the variable of nature near home, except for the lack of a significant correlation between this variable and sense of happiness. Being in nature on the day prior to answering the questionnaire exhibited a weak though significant correlation with positive affect. Exposure to nature images reduced negative affect and stress, while exposure to urban images only reduced negative affect.

Further analyses were conducted to evaluate differences in the extent to which exposure to nature affected women compared to men and elderly compared to younger participants (see Appendix). The findings showed that exposure to nature was more beneficial for women than for men (Table A1). Furthermore, the following interaction emerged for the effect of nature near home: among women without nature near home, the levels of positive affect and vitality were lower, and the level of stress was higher compared to men. For those with nature close to their homes, the opposite was found (Figures A1-A3).

To examine the unique contribution of exposure to nature during the lockdown period to well-being measures, we conducted multiple regression tests for each of the five dependent variables. In addition to the nature exposure variables, the regressions also included the following demographic variables: age, gender, cultural group, and loss of economic status.

Table 9 shows the standardized multiple regression coefficients predicting well-being measures by the study variables across the research groups. All the multiple regression models are significant. The variables that made a significant contribution to the positive affect model are age (positive affect increases with age), economic loss, and exposure to urban images (those who viewed urban images have lower levels of positive affect). The variables that contributed significantly to the negative affect model are age (negative affect is lower among older participants), economic loss (a higher level of negative affect is associated with loss of income), nature near home and nature from windows (both associated with lower levels of negative affect), viewing nature images and viewing urban images. Regarding happiness, the only variables that made a significant contribution to this model are economic loss (negative correlation) and nature from windows (positive correlation).
The variables that significantly predict the vitality variable are age (positive correlation), economic loss (negative correlation) and nature viewed from home windows (positive correlation). For stress, the demographic variables that make a significant contribution to the explained variance are gender (women have a higher level of stress) and economic situation (stress is higher when economic status has been lost). Among the nature exposure variables, both nature from windows and nature near home make a significant contribution to lowering levels of stress. The coefficient for viewing nature images is also significant at the level of p < .05.

4. Discussion

In the current study we tested the extent to which contact with nature during a lockdown contributes to well-being. Specifically, we focused on real nature possibilities which are located in the public sphere, and can be reached within the restrictions, and on the impact of exposure to nature images. The study findings indicate that contact with real nature, during a lockdown contributes significantly to well-being. Having nature near home, being able to view nature from home windows, and actually being in nature, all contributed to higher levels of well-being. The benefits of contact with nature remain even in the face of economic impairment due to the economic crisis brought on by the COVID-19 pandemic. These findings are in line with previous findings regarding the benefits of contact with nature for emotional well-being: beneficial effect of windows view of nature (Kaplan, 2001; Ulrich, 1984), of having nature nearby (Callaghan et al., 2020; Dobson et al., 2021), and of spending time in nature (White et al., 2019). Previous research has suggested that access to nature is essential for mental health, especially for those living in urban areas (Berto, 2014; Shanahan et al., 2015). The current findings extend understanding of the benefits of nature accessibility in stressful times, mainly during emergencies when access to remote nature is impossible. Furthermore, the present findings highlight that contact with nature in stressful times has a dual effect on well-being: enhancement of positive affect and reduction of negative affect and stress. As enhancing positive affect is essential to promote resilience in stressful times (Folkman & Moskowitz, 2000; Lyubomirsky et al., 2005), this dual effect is meaningful.

In addition to providing a general understanding of the contribution of contact with nature to well-being, the study also offers a more differentiated analysis on the contribution of various forms of contact with nature to different measures of well-being. Windows view of nature was associated with all five measures of well-being (people with a view of nature from their windows exhibited higher levels of well-being measures than those with limited or no nature view). Moreover, within the multiple regression analysis from windows contributed significantly to the explained variance of four of these measures. Presence of nature near home was associated with four measures of well-being and within the multiple regression contributed significantly to stress and negative affect. While these findings are in line with previous research on the benefits of nature near home, in the case of a lockdown these findings may also be related to the non-use value of nature. That is, even when people do not make actual use of nature, merely knowing that they can reach nature whenever they want and can appreciate nature for its own sake grants value to nature (Eshet et al., 2006).

Nevertheless, while having accessibility to nature was associated with higher levels of well-being, being in nature on the preceding day was associated only with positive affect but not with any other measure of well-being. As described, enhancing positive affect is an important part of promoting resilience in stressful times. Yet the relatively small overall impact of being in nature on well-being is interesting, considering previous research on the restorative impact of visits to urban nature (Hartig et al., 1991; Ojala, Korpela, Tyrväinen, Tiitinen, & Lanki, 2019; Tyrväinen et al., 2014). A possible explanation for this pattern may be related to the time elapsed since exposure (24 h or less). Thus far, very little research has investigated the enduring impact of being in nature and has only considered the first hour after exposure to nature (Bell & Hanes, 2013; Shanahan et al., 2015). In this study, we asked about exposure to nature on the previous day. It may therefore be assumed that the time elapsed since being in nature reduced its restorative impact.

These results may also be related to the possible unwanted consequences of going outside during these unique times when every incidental contact with other people might have led to Covid-19 infection. This unique situation might have raised the felt stress and negative affect of getting out from the safe home, and therefore, reducing the beneficial effect of going outside. Another possible explanation for this pattern of results may be related to the pathways by which contact with nature promotes well-being. One of these pathways is social interactions (Hartig et al., 2014). However, during the lockdown, when going outside, social interactions with people who were not members of the same household were forbidden, and therefore, this specific mechanism by which contact with nature could promote well-being was avoided.

The study findings also revealed that viewing nature images is associated with lower levels of negative affect and stress, compared to not viewing any images at all. Viewing nature images was also found to contribute significantly to the explained variance of negative affect and stress, even after controlling for the demographic variables and exposure to real nature variables. However, no significant difference was found in the mean levels of positive affect, vitality, and happiness between the nature images group and the control group. Another interesting result that needs further consideration is that viewing urban images was also associated with lower levels of negative affect. Since members of the urban images group had a relatively high percentage of nature near home, this may have reduced the negative affect. This result may also be related to the unique time when the study took place: Unlike other times when individuals can go wherever they want, during the lockdown they were forced to stay at home, and, therefore, even the sight of “normal” urban images may have had an impact in reducing negative affect. At the same time, the restorative impact of viewing nature images might be reduced because of cognitive appraisal of not being able to reach these places during the lockdown, which lead to a lower feeling of joy, vitality and happiness while watching them, comparing to “normal times” when access to these spots of nature is available.

The contribution to the reduction of stress and negative affect along with no impact on positive affect, vitality, and happiness, is in line with some previous research (Brooks et al., 2017; Van den Berg et al., 2015). Furthermore, the different patterns of results between contact with real nature, which had a dual effect on well-being, and contact with nature images, which had impact only on negative affect and stress, is in line with previous findings on the greater impact of exposure to real nature on well-being compared to exposure to virtual nature (Brooks et al., 2017; Kjellgren & Buhrkall, 2010; McMahan & Estes, 2015). Yet, the specific pattern of results in which exposure to nature images was associated with reduced negative affect and stress, but not in enhanced positive affect, vitality, and happiness needs further consideration, which will be addressed in the next section.

Another interesting result of the present study relates to gender differences in the restorative impact of contact with nature. The findings indicated that exposure to nature affected women positively—they were less stressed and more vital than men. These findings are highly important considering the gender differences in the extent to which the pandemic affected people’s well-being (O’Connor et al., 2020; Pouso et al., 2020).

4.1. Theoretical implications

The most important contribution of this study is that contact with nature near home can play an important role in reducing stress and enhancing emotional well-being during emergencies and stressful situations. The beneficial effect of nature on well-being has already been well documented (Bratman et al., 2012; Hartig et al., 2014).
Nevertheless, the findings of this study, which was conducted under the special circumstances of a COVID-19 lockdown, underscore the importance of contact with nature at such stressful times. Our findings extend the findings of recent studies that found a correlation between contact with nature and well-being during the pandemic period (Corley et al., 2021; Dzhambov et al., 2021; Pouso et al., 2020). The findings highlight the unique contribution of contact with nature as a source for the dual process of promoting well-being: enhancing positive affect and reducing negative affect and stress. In particular, they highlight the unique contribution of nature viewed from home windows. Kaplan (2001) suggested that one of the advantages of viewing nature through windows is that there is no time or effort required and no external stressors associated with reaching nature, such as traffic or other factors that might reduce the restorative effect (Kaplan, 2001). Following the findings of the present study, we can suggest that these advantages are particularly relevant during crises that restrict possibilities for going outside.

A second theoretical contribution refers to the role of viewing nature images in promoting well-being during crises. Viewing nature via a computer screen does not provide the 360° view offered by real nature. Nevertheless, the study findings suggest that when contact with real nature is not possible, watching nature images can serve as an alternative source of stress reduction. Furthermore, in the present study, the overall time devoted to viewing nature images was 150 s. This means that even a small interval of watching nature images can serve some restorative function.

From a positive psychology perspective, the findings enhance understanding on the conditions required to enhance positive affect in stressful times. While contact with real nature enhanced both positive and negative affect, viewing nature images was associated only with the negative aspects of well-being (negative affect and stress) and not with the positive ones (positive affect, vitality, and happiness). Craig, Klein, Menon, and Rinaldo (2015) suggested that when individuals experience strong negative internal intensity, such internal stimuli that may overwhelm the ability to experience soft fascination and reflection, prolonged experience in actual nature may be necessary for the restorative signal to occur. The same logic seems to be relevant to the enhancement of positive affect in stressful times, and it can therefore be concluded that contact with real nature during crises has advantages over viewing nature images.

A possible direction for enhancing the impact of exposure to virtual nature on positive affect might be through integrating established positive psychology strategies such as gratitude and pursuing hope and meaning while individuals are exposed to virtual nature sessions. Further research should look for possible impacts of such interventions.

4.2. Practical implications

Research and practice in psychology have searched for strategic means to enhance positive affect and reduce negative affect and stress. Findings regarding such strategies are highly important during stressful times (Diener & Ryan, 2009; Folkman & Moskowitz, 2000; Israel-Cohen et al., 2015). The lockdown dictated by the COVID-19 pandemic poses similar threats. The study findings highlight the importance of providing opportunities for contact with real nature in stressful times and particularly during crises that limit public movement. As socio-economic status is known to be related with access to urban nature (Lee and Maheswaran, 2011; Marmot, 2013; Schwarz et al., 2015), people who confront economic difficulties are more prone to be affected by the stay-at-home restrictions that limit access to green areas. At all times, increase in urban nature space can deliver improved health, and social outcomes for all population groups, particularly among lower socio-economic status groups (WHO, 2017). The study findings highlight the essence of providing access to nature to all people during a crisis. It also shows that contact with nature reduces stress even when confronting economic loss. Because of the initial inequality in access to nature near home, it is important to ensure that individuals of lower socio-economic status have equal access to public spaces, access which is mainly essential in stressful times that require people to stay at home – as in the times of COVID-19 lockdown. The findings also point to the benefits of viewing nature images when contact with real nature is impossible or limited.

The findings highlight the importance of including nature in any urban design and providing access to nature within proximity of all citizens’ places of residence. They also highlight the importance of providing the public the opportunity to go outside to have contact with nature during crises as an important source of promoting resilience. It also seems that providing information to the public on the restorative contribution of contact with real nature and advising the public to go out to nature can serve as an important means of promoting personal and community resilience in stressful times.

Finally, another implication of this study is its suggestion that enhancing nature images is an easy and accessible means of contact with nature when actual contact with nature is impossible or limited.

4.3. Limitations and future research

Previous research has found that different forms and levels of urban nature may have a differential impact on emotional outcomes (Nordh, Hartig, Hagerhall, & Fry, 2009; Tyrvainen et al., 2014). For example, elements such as size, tree canopy density, and vegetation structure may influence the level of impact of contact with nature on mental health (Bratman et al., 2019). In the present study, the variables that described contact with nature were described in a dichotomic manner (e.g., either having or not having nature near home), and no distinction was made between different forms of nature (e.g., trees, flowers, open space, beach), and the extent of nature (e.g., being in a street with boulevard trees or being in a garden surrounding by trees). These may have limited the possibility for more precise information on the effect of various forms of nature on well-being.

In addition, as aforementioned, we asked participants to declare whether they have been in nature in the last 24 h as a general dichotomic variable. A better definition of the time elapsed since they were present in nature might have provided a clearer picture of the link between spending time in nature and well-being during the lockdown.

Furthermore, information on the activity performed while being in nature could also provide a better understanding of the ways being in nature could positively affect well-being during the lockdown. Data on participants in this study lack information on physical exercise while being in nature. As physical exercise is one of the pathways by which contact with nature relates to well-being (e.g., Bratman et al., 2019; Hartig et al., 2014), there is a potential confounding influence of physical activity on the results. Therefore, the observed associations between being in nature and well-being might have been a result of a physiological benefit of exercise rather than being in nature per se. We suggest that future research will systematically address this issue.

Finally, while the study findings confirmed that exposure to nature images contributes to reduced levels of negative affect and stress, the short time of exposure to images may have limited the possible effect of this intervention. It is recommended that future research will manipulate the amount of time devoted to images exposure to assess its impact on the effect of nature images on well-being.

5. Conclusions

Developing individual resilience during exposure to ongoing stressful life events such as the COVID-19 pandemic is important for promoting individual well-being. The findings of the current study highlight the importance of contact with nature near home to well-being during crises. Since many of the world’s population today lives in cities, the availability of urban nature near home is highly important and needs policy makers attention. Planting trees and greenery in the streets, developing urban green parks, paving ways, and making nature
accessible are some of the means governments and local municipalities should promote and foster.

Author statement

Keren Kaplan Mintz: Conceptualization; Methodology; Writing - original draft; Writing – review editing; Project administration; Funding acquisition; Validation. Ofira Ayalon: Conceptualization; Project administration; Funding acquisition, Writing – review editing. Orly Nathan: Conceptualization; Investigation; Resources; Data Curation. Tzipi Eshet: Conceptualization; Methodology; Investigation.

Declaration of competing interest

None.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jenvp.2021.101714.

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