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The Positive Impact of Planting Trees Under an Urban Afforestation Program on Mental Health

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Abstract

The growing body of evidence highlights the beneficial effects of passive nature exposure on mental health parameters, such as affects and subjective vitality. However, there is a lack of empirical data associated with the effects of active involvement in afforestation activities on affects and subjective vitality levels, particularly in urban areas. The current study aimed to evaluate the effects of hands-on participation in urban afforestation activity on affects and subjective vitality in adults. One hundred fifty-two adults participated in a 90-min urban afforestation program. The primary outcome, affect levels, is measured by the Positive and Negative Affect Schedule. The secondary outcome was the subjective vitality, which was analysed by the Subjective Vitality scale. Mediator and moderator effects of participants' connectedness to nature, perceived restorativeness of the environment, exerted physical effort during the activity, menstrual cycle phase, and hours spent walking, exercising, and sleeping were analysed by bivariate correlation and multiple regression. Results showed significant pre-post improvements in positive affect ($t = -9.165$, $p < .001$), negative affects ($t = 7.473$, $p < .001$), and subjective vitality ($t = -5.881$, $p < .001$). The effect sizes of these differences are moderate for positive affects ($d = .734$), negative affects ($d = .554$), and small for the subjective vitality ($d = .439$). Regression models successfully predicted the variances in positive affects (adjusted $R^2 = .169$, $F = 10.560$, $p < .001$), and subjective vitality (adjusted $R^2 = .150$, $F = 9.285$, $p < .001$). The results suggest that adults may benefit from participating in a 90-min urban afforestation program by improving affects and subjective vitality.

Keywords: Afforestation; Mental health; Affect; Subjective vitality

The Positive Impact of Planting Trees Under an Urban Afforestation Program on Mental Health

Afforestation is, by definition, a direct human-induced transformation of land use from non-forest to forest through either planting, deliberate seeding, or promoting natural seed sources (FAO, 2018; United Nations Framework Convention on Climate Change, 2005). Urban afforestation programs are being launched increasingly worldwide as literature evidences the impact of green spaces on the well-being of the rapidly growing urban population (Soga & Gaston, 2016; United Nations, 2019). Accordingly, the United Nations has given place to the promotion of afforestation and reforestation activities among the Sustainable Development Goals (United Nations, 2015). As a result of forming stands of urban forests incorporating mainly native species, thus creating wildlife habitats, the welfare in these areas is promoted by improvements in the air quality and temperature, and energy savings (Jones & McDermott, 2018; Oldfield et al., 2014).

Human health externalities of urban afforestation, however, remain largely unknown despite extensive literature on its environmental and economic benefits. Previous studies are based on transversal designs scoping the correlations between health outcomes and the existence of green space or the occurrence of forest destruction (Jones & Goodkind, 2019). Nonetheless, there is a lack of empirical data associated with the effects of active involvement in afforestation activities on different health parameters, particularly in urban areas (Jones, 2021). Literature has reported the benefits at the neurobiological level for individuals that may redound from the passive reception of sensory information in green environments. Afforestation activities, on the other hand, allow an active interaction with nature by involving one's body structures and functions. By this aspect, humans may self-regulate the number of multisensory inputs from visual, auditory, tactile, and olfactory pathways (Dunn, 2007; Ikei et al., 2017). Participation in urban afforestation activities may be a convenient solution to promote green spaces and in parallel allow city dwellers to benefit from its health effects.

Mental health is a state that consists of emotional, psychological, and social well-being that enables individuals to realize their own abilities and contribute to their community (World Health Organization, 2004). Affects are elementary mental resources that determine the emotional aspects of mental health. This psychological construct is regarded as a neurophysiological state consciously reachable as a basic, nonreflective and noncognitive feeling. These affect states are constantly aroused in varying nature and intensity as a consequence of human interaction with its internal and external world. They may be labelled consciously as pleasure, displeasure, tension, calmness, and so forth. Although the terms “emotion”, “mood”, and “affect” are widely used interchangeably in literature, affect differentiates as a broader concept from the rest as it constitutes the experiential base upon which emotions and moods are generated (Ekkekakis & Russell, 2013). The subjective vitality, on the other hand, is a good predictor of psychological well-being that also has a relation with physical health as opposed to the affect states. This internal experience of energy originates from oneself and the environment and, in turn, reveals the individual’s engagement to perform activities (Fini et al., 2010). Mental health is a growing concern in the rapid urbanization process of today (Ventriglio et al., 2021). In this regard, promoting green spaces in cities may be a plausible contribution to the mental hygiene of urban populations (Tost et al., 2019; van den Berg et al., 2016).

To investigate the potential effects of afforestation activities on emotional and psychological aspects of mental health, I aim to conduct a study evaluating the effects of an urban afforestation therapy program on affect and self-perceived vitality in a sample of healthy adults. I hypothesize that the urban afforestation therapy program can: (a) increase the levels of positive affect and subjective vitality, and (b) decrease the level of negative affect in a sample of healthy adults.

Methods

Design

The study was conducted as a single-group, pretest-posttest clinical trial. The protocol was approved by the Ethics Committee of Provincial Biomedical Research of Granada (CEI-Granada) with reference number 2744-N-21. No changes in the methods have been made following the commencement of the study.

Participants

One hundred fifty-two healthy adults were enrolled in the study. The participants were thoroughly informed about the objective and methods, and their written consent was obtained prior to the intervention. The inclusion criteria were: (a) adults between 18 and 65 years, and (b) any sex and gender. The exclusion criteria were: (a) other severe or medically unstable diseases that may interfere with participation, (b) severe cognitive impairment (Mini-Mental State Examination score < 17 out of 30 points) (Tombaugh & McIntyre, 1992), (c) severe mental disorders in the acute phase or symptomatic phase, (d) severe intellectual disability, (e) behavioural alterations as this may interfere in their participation, and (f) intake of any psychotropic medication.

Setting

All the data collection and exposures were performed in the Parque Tecnológico de las Ciencias de la Salud (37° 8' 56'' N, 3° 36' 19'' W) located in Granada (Spain). The area of plantation was 9.600 m^2. The local climate is classified as a hot-summer Mediterranean climate (Csa) according to the Köppen–Geiger system. Meteorological data were obtained from the nearest meteorological station (37° 8' 10" N, 3° 37' 60" W). Throughout the recruitment period, the average temperature was 27.1°C, the humidity was 28.9%, the wind speed was 13.5 km/h, and the atmospheric pressure was 940.3 hPa.

Intervention

A single-session afforestation activity for ninety minutes was performed by all participants. The interventions were implemented at the same time of the day during the recruitment period of two weeks. A health professional with 10-year experience, two biologists (research assistants), and three gardeners supervised the individual performance of every participant throughout the activity. No serious adverse effects or risks were anticipated; however, the participants were observed and inquired about the presence of some adverse effects on their physical and mental well-being (Peryer et al., 2019).

The afforestation intervention involved land cultivation and transplantation activities at several locations in the green space on the campus. Participants with hoes dug a hole deep and wide enough for the root ball of the plant to fit in and be surrounded both below and on the sides by disturbed soil. The therapist directed the participants' attention to the visual, auditory, olfactory, and tactile features of the plants, soil, and the rest of the biotic and abiotic factors from the green environment. To avoid physical exhaustion, the participants were allowed to have resting periods throughout the intervention.

Each participant has planted two trees, making in total 304 plants including the species: gall oaks (*Quercus faginea*), wild cherry trees (*Prunus avium*), Atlantic pistachio (*Pistachia atlantica*), carob trees (*Ceratonia siliqua*), dog rose (*Rosa canina*), and holm oaks (*Quercus ilex*). The native plants to this region, except Atlantic pistachio, were selected as they thrive well by withstanding ever-higher temperatures and longer periods of drought. The arrangement of the trees differed depending on the characteristics of each area. On some slopes, shrubs were planted according to the quincunx system, with about two meters of separation. The rest was planted in rows along with the lines of existing linden trees (*Tilia x europaea*) and fences of the campus, about six meters from each other. Irrigation was performed by either drip irrigation or sprinkler systems based upon the area.

Evaluations

The primary outcome was the affect. The secondary outcome was the subjective vitality. Two researchers provided the questionnaires. Instructions for completing the inventories were explained above the printed forms and were also reiterated and clarified verbally by the investigators.

Affect

The "Positive and Negative Affect Schedule" (PANAS) was employed to assess the positive and negative affects of the participants (Watson et al., 1988). The questionnaire comprises twenty items that are equally distributed into two independent subscales classified as positive and negative affect. The Spanish adaptation of the negative and positive subscales shows good-to-excellent Cronbach's alpha values of .82 and .92, respectively (López-Gómez et al., 2015). Every item is scored on a five-point Likert scale, from one ("not at all or very slightly") to five points ("a lot"). The total score for each subscale (positive or negative affects) may range between 10 and 50 points. Higher scores in the positive affect subscale represent higher levels of positive affect and lower scores in the negative affect subscale represent lower levels of negative affect. The sample of the current study showed good internal consistency for the positive and negative affect subscales with a coefficient alpha of .88 and .89, respectively.

Subjective Vitality

The levels of energy and aliveness were assessed by employing the Subjective Vitality Scale (Ryan & Frederick, 1997). The Spanish version has shown good internal consistency after removing a negatively worded original item ($\alpha = .87$) (Castillo et al., 2017). The questionnaire instruction was "*Please respond to each of the following statements by indicating the degree to which in general the statement is true for you*". Participants transmitted their vitality level at the present moment by rating six items on a seven-point Likert scale where one stands for "not true at all" and seven for "very true". The sum of scores ranging between 7–42 was used for statistical analyses. Higher scores indicate higher levels of energy and aliveness feeling. The sample of the current study showed good internal reliability for this scale ($\alpha = .83$).

Sample Size

The sample size for this study was calculated by G-Power 3.1.9.7 software, using the difference between two dependent means (matched pairs) with a significance level of 5%, a power of 90%, and an effect size of .272 on the negative subscale in the Positive and Negative Affect Schedule (Maund et al., 2019). To detect differences between the evaluations of pre- and post-intervention, it is necessary to recruit 144 participants in total. This sample was increased by 5%, in the anticipation of possible missing data. Hence, the final sample comprised 152 participants.

Mediators and Moderators

One of the three moderators was the beliefs of the participants regarding nature, which was evaluated by the 13-item Connectedness to Nature Scale (Mayer et al., 2009; Mayer & Frantz, 2004). Another mediator was the restorative properties of the environment that were evaluated at pre-intervention by the 5-item Perceived Restorativeness Scale (Hartig et al., 1996). The last mediator was the exerted physical effort during the activity. It was evaluated by self-reports of the patients on a 15-point Borg Rating Scale of Perceived Exertion (Chen et al., 2002). All scales have been previously validated in Spanish and show good psychometric properties (Castellanos Fajardo & Pulido Rull, 2009; Negrín et al., 2017; Olivos et al., 2011). The internal reliabilities, for the sample of the current study, were good for the Connectedness to Nature Scale ($\alpha = .81$) and acceptable for the Perceived Restorativeness Scale ($\alpha = .76$). Moderators were considered as menstrual cycle phase, and the hours spent walking, exercising, and sleeping.

Statistical Methods

All outcome variables were statistically analysed depending on data type, normality, and homoscedasticity. The Student's t-test was used to evaluate the equality of means in two dependent samples. Delta values were calculated and used to analyse the association between each outcome and mediators/moderators through Pearson bivariate correlation and stepwise multiple regression. The degree of correlation was defined as "negligible" for values from zero to .3, "low" from .3 to .5, "moderate" from .5 to .7, "high" from .7 to .9, and "very high" from .9 to 1.0 (Mukaka, 2012). The effect size estimation was performed by Cohen's *d* and defined as "negligible" for values between zero to .2, "small" for between .2 and .5, "medium" for between .5 and .8, and "large" for values greater than .8 (Fritz et al., 2012). All data were analysed through SPSS v25.0 for Windows (SPSS Inc., Chicago, IL, USA).

Table 1

Anthropometric and sociodemographic data of the study participants (N = 152)

Anthropometric and Sociodemographic Data	**Urban Afforestation Group Mean ± SD or n (%)**
Sex (female)	124 (81.6)
Age (years)	20.18 ± 3.10
Height (cm)	166.72 ± 9.03
Weight (kg)	62.06 ± 11.86
Body mass index (kg/m^2)	22.19 ± 3.24
- Underweight	13 (8.6)
- Normal weight	109 (71.7)
- Overweight	26 (17.1)
- Obese	2 (1.3)
Menstrual cycle	
- Menstruation	34 (27.4)
- Follicular phase	24 (19.4)
- Ovulation	33 (26.6)
- Luteal phase	29 (23.4)
Self-perceived health	
- Excellent	20 (13.2)
- Very good	61 (40.1)
- Good	55 (36.2)
- Fair	14 (9.2)
- Poor	0
Hours spent walking per week	10.67 ± 9.77
Hours spent exercising per week	4.20 ± 4.41
Hours spent sleeping per day	7.01 ± 1.01
Number of smokers	19 (12.5)
- Number of cigarettes per day	4.24 ± 3.66
Marital status	
- Single	151 (99.3)
- Married	0
- Divorced	0
- Widowed	0
Employed	27 (17.8)
Economically independent	7 (4.6)

Note. SD, standard deviation; n, sample size.

Results

One hundred fifty-two adults enrolled in the study. Anthropometric and sociodemographic data of the participants are given in Table 1. No participants have reported any adverse effects.

Effects of Urban Afforestation Therapy Program on Affects and Subjective Vitality

Analysis showed significant pre-post increases in the scores of the positive affect subscale and subjective vitality, as well as a significant decrease in the negative affect subscale score. Table 2 shows mean scores with standard deviations and effect sizes for each dependent variable.

The Relationship Between the Dependent Variables and Exerted Physical Effort, Perceived Restorativeness, and Connectedness to Nature

Bivariate analysis for the positive affect showed significant inverse correlations with time spent sleeping ($r = -.206$, $p = .011$), the subscales of "being-away" ($r = -.240$, $p = .003$) and "scope" ($r = -.160$, $p = .049$) of the Perceived Restorativeness Scale, and a significant direct correlation with connectedness to nature ($r = .226$, $p = .005$).

Table 2

Pre- to post-intervention differences

Outcome Measure	**Urban Afforestation Group**				
	Pre M (SD)	**Post M (SD)**	***t***	***p***	**Cohen's *d***
Positive affect	20.89 (7.53)	26.30 (7.21)	−9.165	**< .001****	.734
Negative affect	7.22 (7.12)	3.78 (4.25)	7.473	**< .001****	.554
Subjective vitality	25.38 (6.79)	28.54 (7.55)	−5.881	**< .001****	.439

Note. M, mean; SD, standard deviation; *t*, Student's t-distribution.

p* < .05; ***p* < .001. Values in **bold indicate statistically significant results.

Table 3

The multiple regression model for the pre-post changes in positive and negative affects in the whole sample (N = 142)

Pre-Post Change in Positive Affects (adjusted r^2 = .169)						
Independent Variables	***B***	**95% CI**		***β***	***SE***	***p***
		LB	**UB**			
Perceived Restorativeness Scale						
- Being-away	−.775	−1.196	−.354	−.287	.213	< .001
Connectedness to Nature Scale	.320	.163	.477	.319	.080	< .001
Time spent sleeping	−1.603	−2.714	−.493	−.222	.562	.005
Pre-Post Change in Negative Affects (adjusted r^2 = .037)						
Independent Variables	***B***	**95% CI**		***β***	***SE***	***p***
		LB	**UB**			
Perceived Restorativeness Scale						
- Being-away	.439	.095	.783	.209	.174	.013

Note. r^2, coefficient of determination; *B*, unstandardized beta; CI, confidence interval; LB, lower bound; UB, upper bound; *β*, standardized beta; *SE,* standard error.

The negative affect showed significant direct correlations with the subscales of "being-away" (r = .209, p = .010) and "fascination" (r = .205, p = .011) of the Perceived Restorativeness Scale. Lastly, the subjective vitality showed significant inverse correlations with the subscales of "being-away" (r = −.178, p = .028) and "coherence" (r = −.244, p = .002) of the Perceived Restorativeness Scale, and a significant direct correlation with connectedness to nature (r = .262, p = .001).

Multivariate regression analysis showed that the subscale of "being-away" in the Perceived Restorativeness Scale, connectedness to nature, and time spent sleeping were significantly related to the positive affect (adjusted R^2 = .169, F = 10.560, p < .001), whereas only the being-away subscale was significantly related to the negative affect (adjusted R^2 = .037, F = 6.369, p = .013). The predictor variables for the positive affect were being-away (p < .001), connectedness to nature (p < .001), and time spent sleeping (p = .005). The predictor variable for the positive affect was being-away (p =

Table 4

The multiple regression model for the pre-post change in subjective vitality in the whole sample (N = 142)

Pre-Post Change in Subjective Vitality (adjusted r^2 = .150)						
Independent Variables	**95% CI**					
	B	**LB**	**UB**	***β***	***SE***	***p***
Perceived Restorativeness Scale						
- Being-away	−.472	−.872	−.073	−.192	.202	.021
- Coherence	−.607	−1.064	−.150	−.211	.231	.010
Connectedness to Nature Scale	.287	.143	.431	.314	.073	< .001

Note. r^2, coefficient of determination; *B*, unstandardized beta; CI, confidence interval; LB, lower bound; UB, upper bound; *β*, standardized beta; *SE,* standard error.

.013). Table 3 shows the final multiple regression model of the positive and negative affects after the selection of independent variables.

The regression model for the subjective vitality showed significant associations between the dependent variable and the subscales of “being-away” and “coherence” in the Perceived Restorativeness Scale, and connectedness to nature (adjusted R^2 = .150, F = 9.285, p < .001). Table 4 illustrates the final multiple regression model of subjective vitality after the selection of independent variables.

For the female sample of the study (n = 114), the only model that included the menstrual cycle was for the positive affect. This regression model showed that the subscale of “being-away” in the Perceived Restorativeness Scale, connectedness to nature, menstruation period, and time spent sleeping were significantly related to the positive affect (adjusted R^2 = .202, F = 8.155, p < .001) (Table 5). The predictor variables were being-away (p < .001), connectedness to nature (p = .001), time spent sleeping (p = .012), and menstruation period (p = .025).

Table 5

The multiple regression model for the pre-post change in the positive affects in the female participants (n = 114)

Pre-Post Change in Positive Affects (adjusted $r^2 = .202$)						
Independent Variables	**95% CI**					
	B	**LB**	**UB**	***β***	***SE***	***p***
Perceived Restorativeness Scale						
- Being-away	−1.061	−1.542	−.580	−.380	.243	< .001
Connectedness to Nature Scale	.299	.122	.475	.291	.089	.001
Time spent sleeping	−1.841	−3.263	−.419	−.222	.717	.012
Menstrual cycle						
- Menstruation period	−3.163	−5.919	−.408	−.196	1.390	.025

Note. r^2, coefficient of determination; *B*, unstandardized beta; CI, confidence interval; LB, lower bound; UB, upper bound; *β*, standardized beta; *SE,* standard error.

Discussion and Conclusions

The results of the current study indicate that involvement in an urban afforestation activity for ninety minutes seems to possess the capability to promote the positive affects, increase vitality feeling, and reduce the negative affects. According to the authors' knowledge, no experimental investigation regarding the direct benefits of afforestation on affects and subjective vitality is available to compare the results. However, a meta-analysis dated 2015 reported the positive impact of nature exposure on both positive and negative affects (McMahan & Estes, 2015). The synthesized results showed a moderate increase in positive affect and a relatively smaller decrease in negative affect, consistent with the present results. Moreover, individuals' sex showed to have no modulation in the results.

More recent experimental studies have also reported benefits of nature exposition in line with the present results (Bielinis, Bielinis, et al., 2019; Bielinis et al., 2018; Bielinis, Łukowski, et al., 2019; Janeczko et al., 2020; Liu, Wang, Liu, An, et al., 2021; Liu, Wang, Liu, Zhang, et al., 2021; Maund et al., 2019; Takayama et al., 2019).

A pilot study has involved sixteen participants partaking in a two-hour session of nature-based activities per week for six consecutive weeks. These sessions offered, in addition to bird watching in a wetland that supports high species richness and abundance, canoeing and guided walks. Significant positive changes in both subscales of PANAS were obtained post-intervention (Maund et al., 2019). Another 5-hour forest recreation program led to a significant decrease in the participants' negative affects by engaging their multiple sensory pathways (Bielinis, Bielinis, et al., 2019). Bielinis et al. have studied the effects of exposure to a city forest during winter in a sample of sixty-two young adults (Bielinis et al., 2018). The 30-min intervention comprised the 15-min observation of the context after walking. Unlike the urban control environment, the exposure to the forest environment with bare trees yielded positive outcomes in both affect subscales and subjective vitality. Similarly, another study involving thirty-two female participants compared the effects of a snow-covered forest on mental health parameters, having an urban street environment and a pre-test indoor condition as control conditions. The participants walked to the destination for 20 min and performed a 15-min relaxation period upon arrival. The between-group analysis showed a marginal effect on positive affects and subjective vitality, favouring the forest setting. Negative affects showed a significant pre-post increase following the urban exposure, whereas the forest group maintained the pre-intervention levels (Bielinis, Łukowski, et al., 2019). Contrary to the previous studies, Janeczko et al. found no differences in positive outcomes on the negative affects and subjective vitality between different types of environments after a half-hour walk (Janeczko et al., 2020). The authors have highlighted the importance of the higher intervention durations and amount of vegetation, whether in a coniferous/deciduous forest or an apartment/green suburb, in achieving more pleasing mental health outcomes. Compared to these nature-exposure studies, the present study connects these benefits with active participation in tree planting that allows a mutualistic interaction with biotic and abiotic factors of green environments. Thus, in addition to the subsequent effects through the greening of urban environments, individuals may yield health benefits from the plantation process itself.

The obtained results can be partially interpreted from the psychological perspective, incorporating the biophilia hypothesis (Wilson, 1984). A recent meta-analysis reported a positive relationship between pro-environmental behaviours of individuals and their positive affect levels, although it does not cover the action of tree planting (Zawadzki et al., 2020). Concordantly, I suggest that participation in tree planting activities may similarly provide these benefits as they are linked to the hypothesis of this meta-analysis. Moreover, these behaviours are linked to eudaimonic well-being, under which the subjective vitality is traditionally conceptualized (Venhoeven et al., 2013). This type of well-being refers to "subjective experiences in which the actions are fully engaged, reflectively endorsed, and aligned with deeply held values and beliefs" (Niemiec, 2014). Conversely, another type of well-being referred to as "hedonic" traditionally reflects the positive affects. Hedonic well-being conceptualises the happiness derived from an instant acquisition of pleasure and refraining from pain. Although it can be expected that active participation in afforestation activities may unfavourably influence the affect levels due to its contra-hedonic aspects (no short-term rewards, time-consuming, and potentially effortful) (Venhoeven et al., 2013), other particularities of these sustainable actions may compensate and result in promoting mental health through a pleasant expression of nature connectedness (Barbiero & Berto, 2021). Thereby, this may have considerable implications in seeking solutions to several problems that we confront nowadays, such as the rise in global temperatures and the emerging burden of mental health problems.

Seventeen per cent of the total variance in positive affect was accounted for in the fitted regression model; this was increased up to 20% among female participants when the menstruation phase is considered. Similarly, the fitted regression model for subjective vitality predicted 15% of the total variance. Among the predictors of these models, restorativeness can be defined as the potential of specific environments and environmental configurations to trigger the psychological and/or physiological recovery process in humans (Joye & Berg, 2018; Negrín et al., 2017). Its subscale "being-away" denotes the degree to which a setting enables individuals to distract themselves from their problems and daily concerns. Another subscale "coherence" refers to the attribute through which the discrete elements of an environment are perceived as part of a whole. In the present study, I have found that restorativeness is inversely related to the positive affect (being-away) and subjective vitality (being-away, coherence). Parallel to these findings, being-away showed direct associations with the negative affect. These results do not converge with previous investigations (Marselle et al., 2015, 2016; Nghiem et al., 2021). On the other hand, another predictor "connectedness to nature" was directly correlated with the changes in the positive affect and subjective vitality in this current research. In line with its positive mediation of the outcomes of nature exposure (Mayer et al., 2009), the current findings suggest that it may also positively mediate/moderate the results of actively participating in afforestation activities. Moreover, hands-on restoration activities (e.g., planting trees) are reported to have the potential to foster a connection to nature (Furness, 2021). A meta-analysis revealed a small but significant association of nature connectedness with positive affect and subjective vitality (Capaldi A. et al., 2014). The small magnitude of this connection is claimed to be no different than the one of other common predictive variables, such as personal income, and education. Therefore, it could be of importance to take into consideration the effects of nature connectedness on positive affect and subjective vitality for future studies on nature-based activities.

In conclusion, in the light of these findings, hands-on participation in a 90-min afforestation activity seems to have beneficial results on the affect and subjective vitality levels of adults.

Limitations

The present study has several limitations: a) The absence of a control group makes it not feasible to attribute the obtained results to the afforestation activity only, and b) the use of oral contraceptives was not controlled among the participants, this could have an influence on the affect levels of participants (Petersen et al., 2014).

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