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Short Nature Walks: A Gateway to Enhanced Psychological Wellbeing?

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Abstract

Nature exposures can improve psychological wellbeing (PW), but the underlying mechanisms still remain unclear. To address this issue, this pilot study investigated the effects of a 15-minute nature walk compared to an urban walk on PW, assessed through self-reported affect (PANAS), state anxiety (STAI-S), trait anxiety (STAI-T), flow experience as well as awe and gratitude sensation. Environmental parameters and salivary cortisol levels were also measured. Participants (N = 50) followed a standardized study protocol. While no significant differences between the groups were observed, descriptive trends suggested greater improvements in PW in the nature condition. Additionally, participants reported higher scores for awe and gratitude and flow, highlighting the potential role of suchlike experiential states in mediating the benefits of nature exposure. These findings underscore the need for further research investigating the complex interplay between environmental conditions and emotional states.

I. Introduction

Walking in nature can enhance mood, reduce stress and support mental health, particularly for individuals with psychological vulnerabilities such as depression or anxiety [1], [2]. Despite these promising findings, questions remain regarding the mechanisms and conditions that drive these benefits. Previous studies [1] found that 50-minute nature walks improved both memory performance and mood in individuals with major depressive disorder, though the effects on cognition and affect appeared to operate through independent pathways. Similarly, systematic reviews as in [2], [3] emphasized the moderating role of the environmental condition, the walk duration and the social interactions in shaping the effects on anxiety and depression. However, findings concerning the mediating role of psychological states like awe and gratitude sensation remain inconclusive. Researchers [4] hypothesized that awe reduces rumination by redirecting attention away from self-focused thought, but their results did not support this mechanism. Therefore, the current study seeks to build on these previous findings by investigating the psychological and physiological effects of brief nature walks. Specifically, it explores how individual and contextual factors contribute to changes in psychological wellbeing (PW). This study focuses on three hypotheses. First, PW will increase after the walking intervention. Second, the increase in PW will be greater in the nature group compared to the urban group. Third, the increase in PW will be linked to indices such as awe and gratitude sensation and flow experience perceived during the walk, as well as trait anxiety.

II. Methods and Materials

This pilot study was conducted between October 29 and November 15, 2024 (total: 10 sessions). Expecting medium effect sizes (d' = 0.25) for differences between time of measurement as well as between the groups, a G*Power analysis was performed, determining the scope of the sample (n= 54). Initially, 53 healthy adults were recruited. Three participants were excluded due to non-compliance with the study protocol or outlier values, resulting in a final sample of 50 (mean age ± SD: 23.4 ± 3.69; nature: n=24, m= 7, f= 17, no specification= 1; urban: n= 26, m= 6, f= 19). Participants were randomly assigned. Before conducting the study, informed consent was obtained from each participant, and they received monetary compensation or course credits thereafter. The study protocol comprised 90 minutes per session, starting at 1:30pm and aimed at testing three participants per session and venue, each. Besides the location, the procedures did not differ between both groups. Both settings were located on or close to the campus of the University of Lübeck. Firstly, participants were asked to fill in the questionnaires assessing PW, followed by taking a salivary cortisol sample. After conducting three tests measuring cognitive performance, the walk was performed. During 15min, participants followed the investigator successively. They were asked to shut down any notification-connected devices to focus on the walk solely. After completing the walk, all questionnaires and tests were repeated, as well as a second salivary cortisol sample was taken. The additional measurements of cognitive performance and salivary cortisol levels will be reported elsewhere.

II.I. Measures

PANAS The German version of the PANAS-Questionnaire (engl.: Positive and Negative Affect Schedule) [5] was utilized assessing immediate levels of affect and overall tendencies of positive or negative mood. Comprising a total amount of 20 words, participants were asked to give their level of approval on a 5-point Likert scale ranging from 1 = “not at all” to 5 = “extremely”. **STAI** The German short version of the State-Trait Anxiety Inventory (STAI)[6] was utilized assessing the participants' trait and state anxiety levels. Whereas the STAI-state-questionnaire (STAI-S) was performed twice before and after the walk, STAI-trait-questionnaire (STAI-T) was solely conducted beforehand. That is based on the assumption that trait anxiety can be defined as a relatively stable propensity to be anxious, varying among individuals, whereas state anxiety is characterized by its situation-dependency and variability. Both short-forms comprised a total of ten statements each, requiring participants level of approval on an 8-point Likert scale ranging ranging from "almost never“ to "almost always“. **Flow Intensity Scale** The Flow Intensity Scale [7] was adapted in this study to assess participants' flow experience during the walk. The overall flow scale consists of 9 items, divided into three subscales: Perceived Challenge-Skill Balance, Absorption and Enjoyment. Responses were recorded on a visual analog scale ranging from 0= "did not experience at all" to 100= "experienced very intensely". A single global flow item was included, asking participants to rate how strongly they experienced flow during the walk. **Awe and Gratitude Scale** The German version of the Awe and Gratitude Scale [8] measures the experiential aspects of awe and gratitude sensation, focusing on individual experiences of emotional responses to moments of beauty, wonder and appreciation. The scale comprises 7 items rated on a 4-point Likert scale ranging from 0= "never" to 3= "very often/regularly" and was adapted referring to the walk specifically. **Other Parameters** Physiological data was collected through participants wearing the fitness watch *AmazFitWatch* during the walk, recording heart rate parameters (min., max., av.), step quantity, speed, elapsed time, as well as the distance covered. Environmental parameters were measured utilizing two sensors of air components (model SPS3x for fine particulates PM2.5 and PM10; model SCD3x for humidity, temperature and CO2-concentration; brand: sensirion). Surrounding noise was captured (min., max., av.-dB-level) using the dB-Meter-App during the walk. **Data Analysis** Data analysis was conducted utilizing the statistical software *R-Studio* (Version 2024.09.0+375 (2024.09.0+375)), additionally *Jamovi* (Version 2.6.17.0) was applied. Three 2x2 mixed models ANOVAs with repeated-measures. Hereby, the twice performed questionnaires of STAI-S, PANAS-Positive (PANAS-P) and PANAS-Negative (PANAS-N) were investigated separately, with and without including the covariates of STAI-T, flow and awe and gratitude. T-tests were calculated for the latter, as well as for the subscales of flow. Post-hoc analysis in addition to *Bayesian analysis* [9], [10] were conducted.

III. Results and Discussion

Study sample and environmental parameters The final study sample of 50 participants did not differ significantly between the groups, regarding demographic parameters of age, gender, level of education and covered travel time. Individual physiological data, revealed non-significant differences (e.g. transport time ($t(48) = .91, p = .368$) or maximum speed ($t(48) = 1.21, p = .229$)) within the study sample, apart from the average heart rate ($t(48) = -2.183, p = .034$, which was significantly higher in the nature group (M-nature= 106.04, M-urban= 100.0). There were no significant differences between the groups and during overall study period concerning environmental parameters (e.g. CO_2 concentration ($t(16) = -0.38, p = .706$), particulate concentrations,

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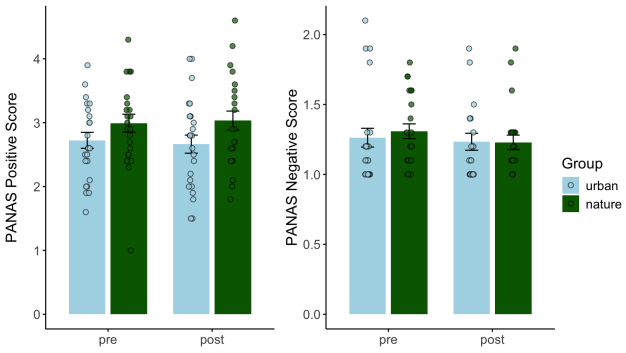

Figure 1: Repeated measures ANOVA without covariates for PANAS-P, sorted by groups (urban; nature) and time (pre; post)

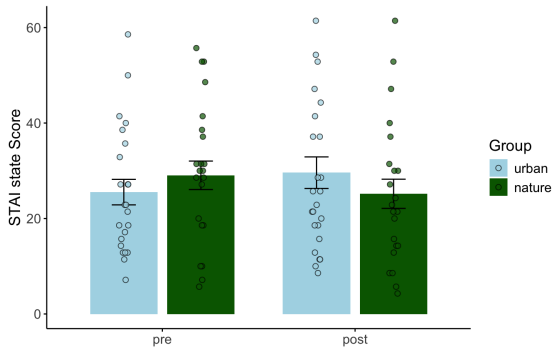

Figure 2: Repeated measures ANOVA for STAI-S without covariates, sorted by groups (urban; nature) and time (pre; post)

including $\text{NumbConc}_{2.5}$ ($t(16) = 0.37, p = .715$) and NumbConc_{10} ($t(16) = 0.37, p = .716$), as well as noise levels (e.g. maximum dBA ($t(17) = -0.04, p = .967$); average dBA ($t(17) = 1.83, p = .085$)) during the walk.

PANAS-P PANAS-P and PANAS-N scores of both groups pre- and post-walk are shown in Figure [1]. A 2x2 ANOVA on PANAS-P with factors group and time revealed no significant main effect of time $F(1,48) = 0.005, p = .943, \eta_p^2 = .000, BF_{10} = 0.21$, a significant main effect of group $F(1,48) = 4.34, p = .043, \eta_p^2 = .083$, and no interaction effect of time and group $F(1,43) = 0.664, p = .420, \eta_p^2 = .015, BF_{10} = 1.6$. Including the covariates, the analysis revealed a significant interaction between time and awe and gratitude $F(1,43) = 5.779, p = .021, \eta_p^2 = .108$.

PANAS-N A 2x2 ANOVA on PANAS-N with factors group and time revealed no significant main effect of time $F(1,48) = 3.636, p = .063, \eta_p^2 = .070, BF_{10} = 1.11$, no significant main effect of group $F(1,48) = 0.005, p = .946, \eta_p^2 = .000$, and no interaction effect of time and group $F(1,43) = 0.043, p = .836, \eta_p^2 = .001, BF_{10} = 0.30$. Including the covariates, the analysis revealed a significant interaction between time and awe and gratitude $F(1,43) = 5.551, p = .020, \eta_p^2 = .120$ as well as between time and trait anxiety $F(1,43) = 10.317, p = .002, \eta_p^2 = .194$.

STAI-S STAI-S scores of both groups pre- and post-walk are shown in Figure [2]. A 2x2 ANOVA on STAI-S with factors group and time revealed no significant main effect of time $F(1,47) = 0.906, p = .346, \eta_p^2 = .02, BF_{10} = 0.41$, no significant main effect of group $F(1,47) = 0.035, p = .852, \eta_p^2 = .083$, and no interaction effect of time and group $F(1,43) = 1.211, p = .277, \eta_p^2 = .027, BF_{10} = 0.41$. Additional analysis including the covariates showed a significant interaction of time and flow to predict reductions in state anxiety (STAI-S; $F(1,43) = 4.418, p = .041, \eta_p^2 = .093$).

IV. Discussion

In contrast to our expectations, the analysis revealed no significant main effects of time and no significant interaction of time and group. However, significant interactions of the factor time and the covariates (flow, awe and gratitude and trait anxiety) predicting the differences of test scores were shown.

The first hypothesis, positing that PW would improve by following the walk was not confirmed. This is in contrast with earlier studies suggesting cognitive and emotional benefits of interacting with nature, such as enhanced attention and mood [1], [3]. This lack of improvements may be due to several factors, including the brevity of the walk and a low distinctiveness of study venues. Previous meta-analyses suggested the necessity of longer and more immersive interventions to produce measurable psychological benefits [3], [2].

The second hypothesis proposed greater enhancement of PW in the nature environment compared to the urban venue. The significant main effect of group in PANAS-P scores reflects an overall stronger expression of positive affect in the nature group. However, interaction effects of time and group were non-significant across all measures, confirmed by Bayesian analyses. The suggestion that the psychological benefits of nature may not always surpass those of urban environments, due to insufficient distinction [4] and individual factors, are in alignment with these results. However, descriptive trends showing minor improvements in PANAS-P scores in the nature group, confirm previous studies indicating that nature can foster positive affect, in dependency on context and measurements [1], [4].

The third hypothesis explored the roles of flow, awe and gratitude and trait anxiety, influencing the changes of PW between pre- and post-measurement. In contrast to the null findings for the direct effects of group, significant interactions emerged when including the covariates. In both groups, a stronger expression of flow experience predicted reductions in STAI-S scores, while

more pronounced awe and gratitude sensation was associated with increases in PANAS-P scores. Also, lower values of trait anxiety significantly interacted with a decrease in STAI-S scores. These results align with research highlighting the psychological benefits of flow [7] and the positive effects of awe and gratitude on emotional wellbeing [8], [4], and underscore the importance of individual psychological experiences and traits, independent of environmental factors.

V. Strenghts, Limitations and Future Perspectives

Strenghts The use of a randomized controlled trial design minimized bias and enhanced internal validity. By integrating covariates, the study provided insights into the psychological mechanisms underlying changes in PW. The ecological validity of the intervention, conducted in real-world outdoor settings during a concise period of time, increases the generalizability of the findings to everyday contexts. **Limitations** Considering that the sample consisted of healthy young adults, limits the generalizability of the findings to other demographic groups. The brief 15-minute duration of the intervention may have been insufficient to produce significant effects on PW. Also, the proximity of the study venues to the university campus may have reduced the intended environmental contrast. Adverse autumnal weather conditions may have affected participants' engagement. Finally, the reliance on self-reported measures could have limited the sensitivity to detect subtle psychological changes. **Future Perspectives** Future research should build on the strengths of this study by further exploring the interplay between physiological, psychological and environmental factors. Expanding the duration of the walks and employing longitudinal designs could help clarify the cumulative effects of nature exposure on mental health. To better understand the role of environmental contrasts, including more distinct settings is recommended. Integrating a third experimental condition involving only visual exposure to nature, could clarify the potential impact of simulated nature on psychological and physiological responses such as in [11], and provide for valuable insights into the potential for low-cost, accessible interventions.

VI. Conclusion

The environmental context (nature vs. urban) did not significantly result in changes in psychological wellbeing (PW). However, the influence of flow and awe and gratitude were evident. These insights open new opportunities for future research, examining the importance of these intrinsic psychological factors in enhancing PW during walking interventions.

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Author's statement

Conflict of interest: Authors state no conflict of interest. Informed consent: Informed consent has been obtained from all individuals included in this study. Ethical approval: The research related to human use complies with all the relevant national regulations, institutional policies and was performed in accordance with the tenets of the Helsinki Declaration, and has been approved by the authors' institutional review board or equivalent committee.

References

[1] M. G. Berman, J. Jonides, and S. Kaplan. The cognitive benefits of interacting with nature. *Psychological Science*, 19(12):1207–1212, 2008, doi:10.1111/j.1467-9280.2008.02225.x.

[2] Y. Kotera, M. Lyons, K. C. Vione, and B. Norton. Effect of nature walks on depression and anxiety: A systematic review. *Sustainability*, 13(7):4015, 2021, doi:10.3390/su13074015.

[3] S. Grassini. A systematic review and meta-analysis of nature walk as an intervention for anxiety and depression. *Journal of Clinical Medicine*, 11(6):1731, 2022, doi:10.3390/jcm11061731.

[4] S. Lopes, M. Lima, and K. Silva. Nature can get it out of your mind: The rumination reducing effects of contact with nature and the mediating role of awe and mood. *Journal of Environmental Psychology*, 71:101489, 2020, doi:10.1016/j.jenvp.2020.101489.

[5] B. Breyer and M. Bluemke. Deutsche Version der Positive and Negative Affect Schedule PANAS (GESIS Panel). *Zusammenstellung sozialwissenschaftlicher Items und Skalen (ZIS)*, 2016, Publisher: ZIS - GESIS Leibniz Institute for the Social Sciences Version Number: 1.0. doi:10.6102/ZIS242.

[6] J. Grimm. State-trait-anxiety inventory nach spielberger. deutsche lang- und kurzversion. *MF-Working Paper*, Methodenforum der Universität Wien: MF-Working Paper, 2009.

[7] C. Peifer and M. Bartzik, Flow-intensity-scale.

[8] A. Büssing, D. Recchia, and K. Baumann. Validation of the gratitude/awe questionnaire and its association with disposition of gratefulness. *Religions*, 9(4):117, 2018, doi:10.3390/rel9040117.

[9] F. D. Schönbrodt and E.-J. Wagenmakers. Bayes factor design analysis: Planning for compelling evidence. *Psychonomic Bulletin & Review*, 25(1):128–142, 2018, doi:10.3758/s13423-017-1230-y.

[10] M. D. Lee and E.-J. Wagenmakers, Bayesian Cognitive Modeling: A Practical Course, 1st ed. Cambridge University Press, 2014, doi:10.1017/CBO9781139087759.

[11] C. Zeng, W. Lin, and Q. Chen. Psychophysiological responses of college students to audio-visual forest trail landscapes. *Journal of Urban Health*, 100(4):711–724, 2023, doi:10.1007/s11524-023-00757-4.