Nature Engagement for Human and Nature's Wellbeing during the Corona Pandemic.

Miles Richardson

Human Sciences Research Centre,

University of Derby

Derby, United Kingdom DE22 1GB

Iain Hamlin

Human Sciences Research Centre

University of Derby

Derby, United Kingdom DE22 1GB

Corresponding author: Miles Richardson

M.Richardson@derby.ac.uk

Published in Journal of Public Mental Health

Richardson, M. & Hamlin, I. (2021) Nature Engagement for Human and Nature's Wellbeing during the Corona Pandemic. Journal of Public Mental Health. DOI: 10.1108/JPMH-02-2021-0016

https://www.emerald.com/insight/content/doi/10.1108/JPMH-02-2021-0016/full/html

Structured Abstract

Purpose: To explore the associations between noticing nature, nature connectedness, time in nature and human and nature's wellbeing during the Corona pandemic restrictions.

Approach: Natural England's People and Nature Survey (PANS) data (n=4206) from the UK was used to assess a number of wellbeing outcomes (loneliness, life satisfaction, worthwhile life and happiness) and pro-nature behaviours as a function of longer-term physical time in nature and psychological connectedness to nature and shorter-term visits and noticing of nature.

Findings: Longer-term factors of nature connectedness and time in nature were both consistent significant predictors of wellbeing measures (apart from loneliness) and pro-nature conservation behaviours. Considered alone short-term visits and noticing were again consistent and significant predictors of three wellbeing measures, but recent visits to nature were not associated with pro-nature conservation behaviours. A combined regression highlighted the importance of a longer-term relationship with nature in all outcomes apart from loneliness, but also revealed that, even when considered in concert with longer-term factors, currently noticing nature had a role in feeling one's life was worthwhile, pro-nature behaviours and loneliness.

Originality: The closeness of the human-nature relationship and noticing nature have rarely been examined in concert with nature visits. Further, the reciprocal benefits of pro-nature behaviours are often overlooked.

Keywords: nature connectedness, nature visits, wellbeing, pro-nature conservation behaviour.

1. Introduction

Human wellbeing depends upon nature's wellbeing (Cardinale et al., 2020). There is a need to understand how the human-nature relationship is associated with human well-being and people's actions to support nature. Two key measures used in research into the human-nature relationship are physical visits or time in nature and the closeness of the psychological connection to the rest of nature. During the restrictions imposed to control the coronavirus pandemic people have turned to nature with increased visits (Natural England, 2020a). There have also been reports of greater awareness of nature (Rousseau and Deschacht, 2020) and of local nature being noticed more (Baillie, 2020; Büssing et al., 2020). Natural England's People and Nature Survey (PANS) in the UK (Natural England, 2020b), conducted during the initial pandemic response in April, May and June 2020, allows further analysis of how the longer-term physical and psychological relationship with nature, and shorter-term visits and noticing of nature are associated with wellbeing and pro-nature behaviours. The current paper presents such an analysis.

During the coronavirus restrictions people have engaged with nature more. For example, through analysing online search behaviours in Europe, Rousseau and Deschacht (2020) found an increase in public awareness of nature-related topics. Similar sentiment analysis showed people were enjoying nature in their local area more (Baillie, 2020). In Germany, these changes included greater conscious experience of quiet times and mindful perceptions of nature, with these changes positively predicting wellbeing (Büssing et al., 2020). In the UK,

between April and June 2020, Natural England's People and Nature Survey (Natural England, 2020a) found that 74% of adults were taking more time to notice and engage with everyday nature. Although a lower level of adults (40%) had spent more time outside during the coronavirus restrictions, with nearly half of those respondents wanting to continue spending more time in nature.

There is a large body of research that shows that visits to and spending time in nature are associated with greater mental wellbeing and such research leads to time or visit based recommendations (Meredith et al., 2020; Tester-Jones et al., 2020). Self-reported visits and time are straightforward measures of exposure and engagement with nature but can lead to a reductionist 'dose-response' perspective (Dobson et al., 2020). More recently, psychological connection to nature has also been found to be associated with higher levels of hedonic (broadly feeling good) and eudemonic (broadly functioning well) wellbeing (Pritchard et al., 2020), with causal links being established between improved nature connectedness through noticing nature and mental wellbeing (McEwan et al., 2019) - nature connectedness being the psychological construct that describes an individual's affinity with nature.

There has been little research that has considered exposure to nature, as measured by time or visits, in concert with a close connection to nature. However when studied together nature connectedness emerges as a key factor in certain wellbeing outcomes, for example eudemonic wellbeing but not life satisfaction, when compared to visits to nature (Martin et al, 2020; Richardson et al., 2021). Similarly, Martin et al. (2020) found that nature connectedness was a significant predictor of pro-nature conservation behaviours, whereas visits to nature was not. This finding was replicated by Richardson et al. (2020a) using the first validated scale of pro-nature conservation behaviours (Barbett et al., 2019). This

research also found that long-term trait nature connectedness and in-the-moment connection through noticing nature were important factors in explaining pro-nature behaviours.

The focus on physical visits, time in nature and subsequent dose recommendations has parallels to the focus on the biomedical model of health rather than reflecting the psychological factors that are significant to wellbeing and reflected in the biopsychosocial model (Engel, 1977). The biomedical model of health essentially views people as separate from the environment and affected by events (Stevens, 2010), for example visits to nature. Recently 'One Health' models of health recognise that humans are embedded within the rest of the natural world where health depends on biology, psychology and nature (Rabinowitz et al., 2018). Similarly, clinical ecology captures how health and biodiversity are connected in a symbiotic relationship (Nelson et al., 2019). When healthcare takes this perspective personal health and planetary health become interlinked, thus engaging the patient in environmental issues. Further, the natural environment becomes essential for wellbeing, rather than a part time resource with a dose sought out when feeling unwell. Nature connectedness and a close relationship with everyday nature becomes a basic psychological need for wellbeing (Baxter and Pelletier 2019; Hurly and Walker 2019; Richardson et al., 2020b).

A time and visits focus with biomedical dose perspective can also result in a policy focus on overcoming the barriers to physical access to nature. While essential for health and indeed a starting point for psychological connectedness, a more nuanced understanding of physical and psychological access to nature can deliver better outcomes for mental wellbeing and pro-nature behaviours. For example, moving beyond provision of local green space and trips to natural landscapes, to infrastructure and events to engage people with and celebrate nature from the 'cliff-top to the bus-stop'.

Importantly, thinking in this area is evolving, yet there is a need for further evidence to support a more holistic approach based on exposure and connection to nature. The PANS in the UK (Natural England, 2020b) includes items to measure time, visits, nature connectedness (Richardson et al., 2019) and pro-nature conservation behaviours (Barbett, et al., 2019). The survey began in April 2020, coinciding with coronavirus pandemic lockdown restrictions in the UK. The current study takes the opportunity to compare longer term measures with short-term measures at a time when people were accessing and noticing nature more (Baillie, 2020; Büssing et al., 2020; Natural England, 2020a; Rousseau and Deschacht, 2020). The analysis explores the relationship between longer-term exposure to nature and nature connectedness, short-term exposure and noticing nature with four standard PANS wellbeing outcomes: loneliness, life satisfaction, eudemonic wellbeing and happiness. Plus, rounding off a one health perspective, pro-nature conservation behaviours.

2. Material and methods

2.1 Approach

To explore the relationships introduced above multiple linear regression analysis was used. The operationalised variables used were items from the PANS. Although such a quantitative approach is reductionist by nature the variable selection and explanatory approach enables a 'one health' perspective to be taken. PANS gathers evidence and trend data on people's enjoyment, access, and attitudes towards the natural environment, and how nature contributes to wellbeing using an online panel of up to 25,000 adults in England on a continuous basis. The data used in the analysis below was collected in April, May and June 2020. During April and early May stay at home restrictions allowed single visits to outdoor spaces. From mid-

May more frequent outdoor visits were permitted, before limited re-opening mid-June and greater easing of restrictions in July.

2.2 Participants

The total sample consisted of 4206 respondents. In the PANS dataset (Natural England, 2020c), ages ranged from 16 to 93 (M = 47.62, SD = 17.49). Gender was almost evenly split between females (51%) and males (48.9%), with the remaining 0.1% identifying with another gender.

2.3 Measures of Dependent Variables

PANS assesses various constructs associated with wellbeing. Loneliness was measured with the item, 'How often to you feel lonely?'. Respondents rated the items on a scale from 1 = '*Often / always*' to 5 = '*Never*'. Satisfaction with life, sense of worthwhile life and happiness were measured, respectively, with the items 'Overall, how satisfied are you with your life nowadays?', 'Overall, how worthwhile are the things you do in your life?' and 'How happy were you feeling yesterday?'. All three constructs were measured on a scale from 0 = *Not at all*' to 10 = '*Completely'*.

2.4 Measures of Predictor Variables

Nature connectedness was measured using the single item 'I feel part of nature' from the Nature Connection Index (NCI; Richardson et al., 2019). Current levels of engagement with nature were measured using the item 'I am taking more time to notice and engage with everyday nature (e.g. listening to birdsong, noticing butterflies)'. Both items were rated on a seven-point scale from 1 = *Completely disagree* to 7 = *Completely agree*. Time in nature was measured using two items, one to measure longer-term baseline levels of time in nature and

one to measure more recent levels. Longer-term levels of time in nature were measured using the item 'In the last 12 months, how often, on average have you spent free time outside in green and natural spaces?' Respondents rated the item on an eight-point scale '*Never*' to '*Every day*' and recoded 1 to 8 for ease of interpretation. Recent time in nature was measured using the item 'How many times, if at all, did you make this type of visit to green and natural spaces in the last 14 days?'. Such visits included those to 'green spaces in towns and cities', 'the countryside' and 'the coast', but not 'time in your garden', 'time outside as part of your job' or 'time spent outside the UK'. Respondents answered by giving a number representing the number of such visits they had made. Several demographic variables were measured, namely age, gender, ethnicity, work and relationship status. Pro-nature conservation behaviour was measured using four items from the Pro-Nature Conservation Behaviour Scale (ProCoBS) (Barbett et al., 2020) that are included in the PANS: 'I plant / maintain pollinator-friendly plants', 'I add log piles or other materials that can be used as a home or shelter by wildlife', 'I provide food for animals such as birds' and 'I maintain plants with berries/fruits'.

3. Results

Following an examination of the bivariate correlations between the main variables of interest, we present the results of multiple regressions that investigate the effect on wellbeing and pro-nature conservation behaviour of baselines levels of time spent in nature and nature connectedness using longer-term items that reach into time before the Coronavirus pandemic. A second set of multiple regressions examines the effect on the outcome variables of increases in noticing nature and visits to nature during the pandemic. A final set of multiple regressions controls for longer-term baseline levels of time in nature and nature

connectedness to clarify the effects on the outcome measures of notice and visiting nature during the pandemic, enabling key short-term items to be identified.

3.1 Correlations between predictors and well-being variables

To investigate the relationship between the four predictor items of interest (nature connectedness, time outside in the last 12 days, number of greenspace visits in the last 14 days, time noticing nature) and the five dependent variables (loneliness, life satisfaction, sense of worthwhile life, happiness, pro-nature conservation behaviour), a series of bivariate correlations were performed. As shown in Table 1, there were significant correlations between all predictor variables and all the dependent variables apart from loneliness.

Table 1. Bivariate correlations between the main variables of interest (N in parentheses)

	1.	2.	3.	4.	5.	6.	7.	8.
1. Loneliness								
2. Life Satisfaction	.48* (4653)							
3. Worthwhile	.46* (4653)	.78* (4654)						
4. Happiness	.49* (4653)	.76* (4654)	.74* (4654)					
5. Pro-nature conservation	.11 (1263)	.19* (1264)	.23* (1264)	.19* (1264)				
6. Nature Connectedness	.02 (4297)	.14* (4207)	.17* (4207)	.12* (4207)	.35* (1334)			
7. Time outside in last 12 months	-.01 (4653)	.13* (4654)	.13* (4654)	.13* (4654)	.15* (1493)	.27* (5413)		
8. Number of visits in last 14 days	.03 (4206)	.11* (4206)	.11* (4206)	.1* (4206)	.09* (1035)	.22* (3912)	.48* (5638)	
9. Increase in time noticing nature	-.02 (4136)	.12* (4137)	.17* (4137)	.11* (4137)	.35* (1184)	.55* (4101)	.27* (4137)	.23* (3744)

* = p <.01

3.2 Multiple regressions to examine relationships between the predictors and both wellbeing and pro-nature conservation behaviour

In order to further investigate the relationship between nature connectedness, time in nature and engagement with nature and the five dependent variables, we performed a series of hierarchical multiple regressions. In each regression, there was an initial block of demographic variables consisting of age, gender, employment status and ethnicity. For each regression, the assumptions for multicollinearity and independence of errors were met (VIF = 1.002 – 1.955, Tolerance: .512 – .998, Durbin-Watson = 1.931 – 2.058).

Several demographic variables predicted wellbeing and pro-nature conservation behaviour. Both age and being in a relationship were consistently significantly and positively related to all DVs (βs = .128 - .296). Being separated was associated with increased loneliness (β = -.042). Being female was significantly associated with being lonelier (β = -.091), less satisfied (β = -.043) and less happy (-.055). Not working was associated with less satisfaction (β = -.098), less happiness (β = -.078) and less sense of a worthwhile life (β = -.112) compared to being in work. Students reported being less lonely (β = .07) and more satisfied (β = .091) than those in work, and felt they had more worthwhile lives (β = .074).

3.3 Multiple regressions on the effects of long-term nature connectedness and time in nature. To understand the relationship between baseline time in nature and wellbeing and pro-nature conservation behaviour, one multiple regression was performed for each of the five dependent variables, with nature connectedness and time spent in nature in the last 12 months constituting the second block of predictors. One-way ANOVAS were performed to establish whether time spent in nature in the last 12 months and nature connectedness had remained consistent across all three waves of the survey. Both nature connectedness

($F(2,4510) = .26$, $p = .85$) and time spent in nature in the last 12 months ($F(2,6246) = 1.58$, $p = .21$) did not differ significantly across the three waves of the survey confirming their suitability as longer-term measures. As shown in Table 2, both nature connectedness and time spent in nature predicted all of the dependent variables, apart from loneliness. Neither of the items were significant predictors of loneliness.

Table 2. Summary of standardised betas and R-square values for baseline linear regressions, after controlling for individual covariates.

	NC	Nature time last 12 months	R Square Change - NC	R Square Change - Time	Adj. R Square - complete model
Loneliness	.01	.00	.00	.00	.14*
Satisfaction	.11*	.09*	.02*	.01*	.08*
Worthwhile	.14*	.08*	.03*	.01*	.10*
Happiness	.09*	.09*	.01*	.01*	.07*
ProCoBS	.31*	.09*	.12*	.01*	.18*

** = $p < 0.05$; NC = Nature Connectedness*

3.4 Multiple regressions on the effects of noticing nature and time in nature during the pandemic. A further set of multiple regressions were computed to investigate the effect of recent levels of engagement with nature and time in nature on wellbeing and pro-nature conservation behaviour. As reported in Table 3, both items significantly predicted all wellbeing variables, apart from loneliness. Only engagement with nature predicted loneliness, with increases in time noticing nature associated with increases in loneliness. Similarly, time noticing nature was the only significant predictor of pro-nature conservation behaviour, with increases in noticing associated with increases in pro-nature conservation behaviour.

Table 3. Standardised Betas and R-Square values for current linear regressions, after controlling for individual covariates.

	More time noticing	Recent nature visits	R Square Change – noticing & visits	Adj. R Square - complete model
Loneliness	-.05*	.01	.00*	.14*
Satisfaction	.08*	.06*	.01*	.07*
Worthwhile	.13*	.06*	.02*	.09*
Happiness	.09*	.06*	.01*	.06*
ProCoBS	.33*	.04	.11*	.18*

** = p < 0.05; NC = Nature Connectedness*

3.5 Multiple regressions on the effects of long-term nature connectedness and time in nature and noticing nature and time in nature during the pandemic. A final set of multiple regressions included all predictors used in the previous two sets of multiple regressions. With demographic variables again in the first block, a second block comprised baseline measures of nature connectedness and time in nature, and a third block included recent levels of engagement with nature and time in nature. As shown in Table 4, the only significant predictor of loneliness was recent time spent engaging with nature. Increases in this item were associated with increases in loneliness. Satisfaction and happiness were predicted only by the block of baselines measures; recent engagement with and time in nature were unrelated to both satisfaction and happiness. All items apart from recent time spent in nature were significant predictors of sense of worthwhile life and pro-nature conservation behaviour.

Table 4. Standardised Betas and R-Square values for combined linear regressions, after controlling for individual covariates.

	NC	Nature time last 12 months	More time noticing	Recent nature visits	Adj. R Square - complete model
Loneliness	.03	-.01	-.06*	.01	.14*
Satisfaction	.09*	.06*	.02	.02	.08*
Worthwhile	.1*	.05*	.07*	.03	.1*
Happiness	.07*	.07*	.04	.01	.07*
ProCoBS	.23*	.08*	.18*	-.02	.21*

** = $p < 0.05$; NC = Nature Connectedness*

4. Discussion

The context of the coronavirus restrictions provided unique insight into how the longer-term exposure to nature and nature connectedness, and short-term visits and noticing of nature are associated with wellbeing and pro-nature behaviours. The longer-term measures of nature connectedness and time in nature were both consistent significant predictors of three wellbeing measures and pro-nature conservation behaviours. Considered alone, without controlling for longer-term measures, the more current indicators were again consistent and significant predictors of three wellbeing measures. However, there was a weak significant association between increased noticing of nature and increased loneliness and recent visits to nature was not associated with pro-nature conservation behaviours. The combined regression highlighted the importance of a longer-term relationship with nature in all outcomes apart from loneliness, but also revealed that the short-term increase in noticing nature had a role in feeling one's life was worthwhile life, pro-nature behaviours and an association with loneliness. Thus informing public mental health programmes in the longer term.

The finding that longer-term measures of nature connectedness and time in nature over twelve months were both consistent and significant predictors of higher levels of three wellbeing measures (satisfaction, happiness and worthwhile life) and pro-nature conservation behaviours is broadly consistent with the previous research in this area (Martin et al, 2020; Richardson et al., 2021). As noted above, there has been little research that has considered exposure to nature and nature connectedness together. Previously, visits to nature, rather than nature connectedness, has been related to life satisfaction; with nature connectedness, rather than time in nature, being associated with a worthwhile life (Martin et al, 2020). Richardson et al., (2021) found that time in nature was not a significant predictor of happiness or worthwhile living, but nature connectedness and noticing nature were. These inconsistencies could be reflective of the sample or differences between measuring self-reports of time in nature rather than visits to nature. However, although the current study found a more consistent role for time in nature in explaining wellbeing, the strength of relationship was generally lower than for nature connectedness, apart from for happiness where the contribution was similar. Finally, the need to consider nature connectedness in addition to time and visits to nature is confirmed, a finding repeated three times in recent research with different large scale data sets. Both physical and psychological access to nature matter.

Moving on to pro-nature conservation behaviours, the results are again consistent with recent research that has considered time or visits and nature connectedness together. Martin et al (2020) found that nature connectedness, rather than visits to nature, was a significant predictor of pro-nature conservation behaviours. A finding replicated by Richardson et al. (2020a) using the pro-nature conservation behaviours scale (Barbett et al., 2019). Using that same scale, the current research also found that both nature connectedness and time outside are related to pro-nature conservation behaviours, but the relationship between higher nature

connection and pro-nature behaviour is much stronger. Once again, the need to consider nature connectedness when considering pro-nature conservation behaviours is repeated for a third time in recent research on different large-scale datasets.

The longer-term measures of nature connectedness and time in nature were unrelated to loneliness. Social relationships are important for wellbeing, so clearly the social distancing and 'stay at home' measures used in response to the pandemic provided a challenge to keeping well. Previous research has found that nearby nature can offer socially isolated people an alternative way of feeling connected, buffering the effect of low social connectedness (Cartwright et al., 2018). It is possible the single item measure of loneliness in the current study, rather than measure of social connectedness used by Cartwright and colleagues, did not tap into this relationship. Further, it might be that the alternative connections nature can bring are reflected in other measures of wellbeing, for example nature connectedness has been found to predict happiness over and above how generally connected people feel to family and friends (Zelenski & Nisbet, 2014). Therefore, the significant relationship between nature connectedness and happiness in the current study could reflect this. The findings from the shorter-term measures, that is spending more time noticing nature, do show a relatively small, but significant negative relationship to loneliness. Higher levels of noticing were associated with higher levels of loneliness. As a cross-sectional survey the direction of this relationship is unknown, rather than increased noticing of nature increasing loneliness, the finding could reflect that as loneliness increases people turn to nature and spend more time noticing it, buffering the effect of reduced social connectedness (Cartwright et al., 2018). The relationship between engaging in a relationship with nature, social isolation and loneliness is a topic deserving further research.

Continuing with the shorter-term measures of noticing and recent visits to nature, without controlling for longer-term measures in the first instance, the findings are broadly consistent with the results when considering longer term nature connection and time in nature alone, although recent visits to nature is not a significant predictor of pro-nature behaviours. Considering these short-term measures alone, in the context of people visiting and tuning in to nature during the pandemic restrictions, (Baillie, 2020; Büssing et al., 2020; Natural England, 2020a) these findings suggest that this change had a role across wellbeing outcomes. However, given the similarity in results between timescales, these results could reflect that the longer and shorter-term measures are measuring the same thing. Time outside over twelve months is a very similar measure to visits in the last 14 days, although the correlation between the two is moderate rather than strong. Time noticing nature is conceptually different to nature connectedness but can be considered as a lived experience of nature connectedness. Further, the correlation between the two is weaker and the question specifies recent increases in noticing at a time of increased engagement with nature (Baillie, 2020; Büssing et al., 2020; Natural England, 2020a; Rousseau and Deschacht, 2020).

The combined regression controls for these potential issues as both the longer and short-term measures are included. Once again, the findings for the longer-term measures are broadly consistent with previous results. However, the combined analysis confirms that spending more time noticing nature is associated with people reporting their life is worthwhile and engaging in more pro-nature behaviours. In the context of people's response to pandemic restrictions, these findings suggest that noticing more nature (Baillie, 2020; Büssing et al., 2020) was important for eudemonic, rather than hedonic wellbeing, with those benefits being accompanied by higher levels of pro-nature behaviours. As indicated by the moderate correlation between noticing and nature connectedness, it does not appear that noticing nature

is a proxy measure of longer-term nature connectedness, rather an activity understandably related to it. In the combined regression, recent nature visits drop from significance, with longer-term time in nature being significant across all outcome variables, other than loneliness. Finally, once again, the contribution of nature connectedness is higher than time in nature for life satisfaction and a worthwhile life, a difference that is particularly notable for pro-nature conservation behaviours. These findings suggest that a behaviour change in noticing more nature, although brought on by the coronavirus restrictions, can play a key role in eudemonic wellbeing. With the longer-term level of nature connectedness, itself achieved through noticing nature (McEwan et al. 2019), having a role in hedonic wellbeing alongside a longer-term habit of spending time in nature.

It is also interesting to consider the results within the context of the pandemic and why people turned to nature. Clearly the 'stay at home' message in the UK and general restrictions meant being outdoors was one of the few permissible activities. This resulted in people enjoying nature in their local area more (Baillie, 2020) and this change in behaviour included greater quiet contemplation and mindful perceptions of nature (Büssing et al., 2020). It seems that more people discovered that nature can help manage emotions (Richardson, 2019) and this involved greater noticing of nature. It is also interesting to note that during the restrictions in the UK a greater proportion of adults reported taking more time to notice and engage with everyday nature (74%) than those spending more time outside (40%; Natural England, 2020a).

While providing unique insights and controlling for several demographic variables the results should be considered within the context of several limitations. First, our analyses were correlational in nature and so the causal connections between the variables cannot be inferred

with complete confidence. Although complimentary experimental research exists which more clearly demonstrates the effect of increased noticing and connection with nature on wellbeing (McEwan et al., 2019), additional experimental studies would be welcome. Second, most of the data presented is based on retrospective self-reports that may be subject to recall bias. Third, in our interpretation of the results, we compare the predictive validity of recent increases in time noticing nature with recent visits to nature. We make such comparisons tentatively though because we recognise that these two variables are not directly comparable: one measures increases over an unspecified time period, the other measures levels over the past 14 days.

In sum, during the restrictions imposed to control the coronavirus pandemic people turned to nature through visiting and noticing it more. The results presented above suggest that the short-term changes in noticing had a role in people's wellbeing; particularly for feeling one's life is worthwhile. Although conducted at a unique time of enforced behaviour change, the results are of relevance to the changes needed to improve human and nature's wellbeing in the longer term. The importance of nature connectedness and noticing nature in addition to time in nature was confirmed. It is becoming clear that emotional and psychological access to nature matters, as much and perhaps more so than time in nature for certain outcomes. The current findings together with recent research support a more holistic approach based on increasing access and fostering a close connection with nature, through noticing nature (McEwan et al. 2019) and systematic application of the pathways to nature connectedness (Lumber et al., 2017; Richardson et al, 2020b) to public engagement activity and green infrastructure.

Turning to nature for wellbeing during the corona pandemic has been a reminder that human wellbeing depends upon nature. This highlights the relevance of 'One Health' models of health that recognise that humans are embedded within the rest of the natural world and that nature is essential for wellbeing. The current results also highlight the reciprocal relationship where a close connection with nature is associated with pro-nature behaviours. The evidence is mounting that political and practical efforts should focus on creating a new human-nature relationship, creating a long-term habit of being out in, and connecting with nature and an everyday habit of noticing nature. This should inform efforts to restore mental health in the pandemic recovery with noticing everyday nature featuring in public health campaigns, green infrastructure, and social prescriptions in an environment where the public should have a renewed appreciation of the role local green spaces can have in managing mental wellbeing.

Funding statement: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

References

Baillie, R. (2020). How social distancing has renewed our love for nature, and what it means for a sustainable future. *Granite Journal: a Postgraduate Interdisciplinary Journal, 4*(1), 27-36.

Barbett, L., Stupple, E. J., Sweet, M., Schofield, M. B., & Richardson, M. (2020). Measuring actions for nature—development and validation of a pro-nature conservation behaviour scale. *Sustainability, 12*(12), 4885.

Baxter, D. E., & Pelletier, L. G. (2019). Is nature relatedness a basic human psychological need? A critical examination of the extant literature. *Canadian Psychology/psychologie canadienne*, *60*(1), 21.

Büssing, A., Recchia, D. R., Hein, R., & Dienberg, T. (2020). Perceived changes of specific attitudes, perceptions and behaviors during the Corona pandemic and their relation to wellbeing. *Health and Quality of Life Outcomes*, *18*(1), 1-17.

Cardinale, B. J., Duffy, J. E., Gonzalez, A., Hooper, D. U., Perrings, C., Venail, P., ... & Kinzig, A. P. (2012). Biodiversity loss and its impact on humanity. *Nature*, *486*(7401), 59-67.

Cartwright, B. D., White, M. P., & Clitherow, T. J. (2018). Nearby nature 'buffers' the effect of low social connectedness on adult subjective wellbeing over the last 7 days. *International journal of environmental research and public health*, *15*(6), 1238.

Dobson, J., Birch, J., Brindley, P., Henneberry, J., McEwan, K., Mears, M., Richardson, M. & Jorgensen, A (2020). The magic of the mundane: The vulnerable web of connections between urban nature and wellbeing. *Cities*, 108, 102989.

Engel, G. L. (1977). The need for a new medical model: a challenge for biomedicine. *Science*, *196*(4286), 129-136.

Hurly, J., & Walker, G. J. (2019). Nature in our lives: Examining the human need for nature relatedness as a basic psychological need. *Journal of Leisure Research*, *50*(4), 290-310.

Lumber, R., Richardson, M., & Sheffield, D. (2017). Beyond knowing nature: Contact, emotion, compassion, meaning, and beauty are pathways to nature connection. *PloS one*, *12*(5), e0177186.

Martin, L., White, M. P., Hunt, A., Richardson, M., Pahl, S., & Burt, J. (2020). Nature contact, nature connectedness and associations with health, wellbeing and pro-environmental behaviours. *Journal of Environmental Psychology*, *68*, 101389.

McEwan, K., Richardson, M., Sheffield, D., Ferguson, F. J., & Brindley, P. (2019). A smartphone app for improving mental health through connecting with urban nature. *International journal of environmental research and public health*, *16*(18), 3373.

Meredith, G. R., Rakow, D. A., Eldermire, E. R., Madsen, C. G., Shelley, S. P., & Sachs, N. A. (2020). Minimum time dose in nature to positively impact the mental health of college-aged students, and how to measure it: a scoping review. *Frontiers in psychology*, *10*, 2942.

National Trust (2020). Noticing nature: The first report in the Everyone Needs Nature series. Retrieved January 15th, 2021, from https://nt.global.ssl.fastly.net/documents/noticing-nature-report-feb-2020.pdf

Natural England (2020a). The People and Nature Survey for England: Key findings for the period April to June 2020 (Experimental Statistics). Retrieved January 15th, 2021, from https://www.gov.uk/government/statistics/the-people-and-nature-survey-for-england-adult-data-y1q1-april-june-2020-experimental-statistics

Natural England (2020b). The People and Nature Survey for England. Retrieved January 15th, 2021, from https://www.gov.uk/government/collections/people-and-nature-survey-for-england

Natural England (2020c). People and Nature Survey Dataset for April to June 2020. Retrieved January 15th, 2021, from https://www.gov.uk/government/statistics/the-people-and-nature-survey-for-england-adult-data-y1q1-april-june-2020-experimental-statistics

Nelson, D. H., Prescott, S. L., Logan, A. C., & Bland, J. S. (2019). Clinical ecology—transforming 21st-century medicine with planetary health in mind. *Challenges*, *10*(1), 15.

Pritchard, A., Richardson, M., Sheffield, D., & McEwan, K. (2020). The relationship between nature connectedness and eudaimonic well-being: A meta-analysis. *Journal of Happiness Studies*, *21*(3), 1145-1167.

Rabinowitz, P. M., Pappaioanou, M., Bardosh, K. L., & Conti, L. (2018). A planetary vision for one health. *BMJ global health*, *3*(5).

Richardson, M. (2019). Beyond restoration: considering emotion regulation in natural well-being. *Ecopsychology*, *11*(2), 123-129.

Richardson, M., Dobson, J., Abson, D. J., Lumber, R., Hunt, A., Young, R., & Moorhouse, B. (2020b). Applying the pathways to nature connectedness at a societal scale: a leverage points perspective. *Ecosystems and People*, *16*(1), 387-401.

Richardson, M., Hunt, A., Hinds, J., Bragg, R., Fido, D., Petronzi, D., Barbett, L., Clitherow, T., & White, M. (2019). A measure of nature connectedness for children and adults: Validation, performance, and insights. *Sustainability*, *11*(12), 3250.

Richardson, M., Passmore, H. A., Barbett, L., Lumber, R., Thomas, R., & Hunt, A. (2020a). The green care code: How nature connectedness and simple activities help explain pro-nature conservation behaviours. *People and Nature*, *2*(3), 821-839.

Richardson, M., Passmore, H. A., Lumber, R., Thomas, R., & Hunt, A. (2021). Moments, not minutes: The nature—well-being relationship. *International Journal of Wellbeing*, *11*(1).

Rousseau, S., & Deschacht, N. (2020). Public awareness of nature and the environment during the COVID-19 crisis. *Environmental and Resource Economics*, *76*(4), 1149-1159.

Stevens, P. (2010). Embedment in the environment: A new paradigm for well-being?. *Perspectives in public health*, *130*(6), 265-269.

Tester-Jones, M., White, M. P., Elliott, L. R., Weinstein, N., Grellier, J., Economou, T., & Nieuwenhuijsen, M. (2020). Results from an 18 country cross-sectional study examining experiences of nature for people with common mental health disorders. *Scientific reports*, *10*(1), 1-11.

Zelenski, J. M., & Nisbet, E. K. (2014). Happiness and feeling connected: The distinct role of nature relatedness. *Environment and behavior*, *46*(1), 3-23.