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Wilderness as therapeutic landscapes for people in later life: towards an understanding of place-based mechanisms for wellbeing through nature-adventure activity

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Abstract:	While there is considerable evidence that therapeutic landscapes have a positive impact on wellbeing, we know little about the mechanisms through which this impact occurs. In this paper we go some way toward addressing this gap. Drawing on in-depth interviews with 12 people aged between 52-75 years of age, who are engaged in nature-adventure activity in the UK, we focus on what they understand by 'wilderness'; their experiences of nature-adventure in wilderness settings; and the impact of these experiences on their wellbeing. Moving beyond the largely behavioural focus of laboratory-based studies prevalent within environmental psychology, we highlight the importance of understanding the role of the contextual in the therapeutic relationship. That is, how relational, embodied, social, lifecourse and/or cultural factors that are constitutive of wilderness environments impact wellbeing for those engaged in nature-adventure activity in later life. In doing so, we map out a working model of the mechanisms that impact wellbeing within this context. Our data suggest that there is no one single mechanism, rather we need to think about a range of mechanisms, often operating across a series of spectra (active/passive; safety/risk; alone/socially etc) and importantly, each are connected to place. Hence, we suggest, that where that activity takes place is instrumental for wellbeing.

Wilderness as therapeutic landscapes in later life: towards an understanding of place-based mechanisms for wellbeing through nature-adventure activity

Response to Reviewers Comments

We thank the reviewers for their overall positive response to our paper and their helpful suggestions. In particular we thank them for taking the time to give such detailed responses to our submission,. We have sought to address or respond to each of the comments in our revised paper and have indicated how we have done so below. We have highlighted changes in yellow in the revised submission.

Reviewer #1: Review of "Wilderness as therapeutic landscapes for older people: towards an understanding of place-based mechanisms for wellbeing through nature-adventure activity"

This paper seeks to highlight how active engagement with wild places influences the wellbeing of older individuals who participate in nature-adventure activities. The study is based on a convenience sample of twelve individuals, aged fifty or older, who engage in nature-adventure activities such as mountain biking, ultra running, rock climbing, or open water swimming, and the author(s) engages literatures in environmental psychology and health geography, specifically focusing on concepts relating to therapeutic landscapes.

The aims of the paper are appropriate for this journal, and the paper is well-written, clear, and engaging. The paper is also usefully positioned to address questions that have not previously been adequately resolved, including how nature-based adventure activities influence or benefit older individuals. I recommend publication pending substantial revisions in order to create more consistency in the analysis and a clearer engagement with the key concepts presented. In the following, I highlight questions and concerns to consider with the revisions.

Thank you for your positive response.

The first section of the Findings focuses on "Defining Wilderness." While this is interesting and the quotes offered provide examples of how wilderness is conceptualized by the interviewees, the question of how participants define wilderness is never presented as a focus of the study. It would be helpful to explain directly from the outset how and why these findings are relevant to the primary research question. I can see that conceptions of wilderness are useful, in terms of explaining where participants go for their adventure activities, but would like to see this articulated more explicitly - or perhaps brought in later, after the main question has been addressed.

Thank you, this issue was also raised by R2. Given some of the critical discussion that exists around the definition of wilderness, we felt it was important for both the study and the reader to understand just exactly what it was that our respondents were referring to when they were discussing their engagement with wilderness for nature-adventure activity. To make our rationale for this clearer, we have revised this part of the paper to emphasise for the reader why we felt it important to first have an understanding of how wilderness was conceptualised by our participants.

We have added the following text (pp5-6):

As Carver and Fritz (1995) pointed out however, defining wilderness is notoriously difficult, and whilst some formal definitions exist (such as the US Wilderness Act 1964), most stress the natural state of the environment together with the absence of human habitation and other human influences. Because the idea of wilderness is largely one of personal experience and perception, identifying the

point at which wilderness in absolute terms begins is subjective, (Carver and Fritz, 1995). Hence, to begin to understand how the therapeutic relationship between wilderness and wellbeing is manifest, it is also important to understand what wilderness means to the individual.

As well as making it clearer within our aims and objectives that understanding how participants defined wilderness was a key part of our study. (see p7)

As a small point, for readers unfamiliar with the Duke of Edinburgh's scheme, a brief explanation of what this is and entails would be helpful.

The Duke of Edinburgh's scheme is a self-development scheme for young people operating in over 144 countries globally. As such we do not feel it needs much by way of further explanation, but we have clarified that it is a self-development programme and provided a reference to the scheme for those who may be unfamiliar with it. (see p.11)

Figure 3 on p. 13 is attractive and easy to digest, but I do wonder if it ought to be slightly modified to better reflect the point on p. 15 (lines 26-27) that "there is no one single mechanism, [but] rather… a range of mechanisms" that explain how therapeutic landscapes contribute to wellbeing. In the figure, we see a range of mechanisms represented by the seven dials, but each dial appears to be pinned to a particular setting. This apparently reflects the author's analysis from the twelve interviews, but I can't help but question if a more diverse or robust sample of respondents would have led to the need to create a more open or dynamic representation of dials. Military veterans who participate in nature-based adventure programs frequently mention the importance of group dynamics and camaraderie, for example, and the popularity among seniors of Sierra Club or similar kinds of organized group outings would suggest that the "social-alone" dial is not necessarily more often tilted toward "alone."

Thank you for raising this point. The dials which were simply meant to seen as illustrative of dimensions along which people varied rather than indicative of where our participants actually sat along the gauge. Indeed the point we were trying to make is that individuals will sit at different points across these gauges, and indeed where they sit may change over time. However, we thank the reviewer for pointing out the potential for misconception here recognise and so have redrawn the dials with varied points and have added a sentence to the paper to clarify that the points on the dials within our model are indicative only. (See Figure 1 and pp 23-24)

The text in lines 46-55 on p. 13 actually articulates a nicely open understanding of the various mechanisms influence individuals' experiences; I'd like to see this heterogeneity of activities and their influences reflected better in Figure 3.

We have revised Figure 3 (now Figure 1) to illustrate how wellbeing is determined by ability to achieve a person's preferred level of engagement / absorption PLUS the qualities of the wild spaces. (see Figure 1)

I also found the Discussion on p. 14 to be inconsistent in its orientation toward older individuals. The three aspects listed on lines 27-37 did not strike me as being particular to older people, but rather are mechanisms that any participants in adventure-based programs would experience. The paragraph that follows, however (lines 39-54) more effectively identifies distinctive patterns that would pertain to older individuals.

We agree that the 3 mechanisms are likely to be relevant to any age. Our point is not that the underlying mechanisms are completely different in later life, rather it is how these mechanisms are likely to be activated differently and change as we get older. We illustrate this in the following paragraph. To make this clearer, we have amended the text to state explicitly that while some of these

mechanisms are likely to be important across the board, what our paper is seeking to do is highlight this shift. (p.26)

At the bottom of p. 14 and top of p. 15, I'd like to see the author lean a bit harder on limitations of the study. What do they think they might find with a more diverse sample, for instance? Or, given the limited sample, is it really appropriate to develop a model as fixed as it appears in Figure 3?

Thankyou. We definitely do not view our model as fixed and explicitly state this in our conclusion – rather we see it as offering as a starting point which we hope would be amended and refined over time. We would be delighted to see it develop as more research is undertaken with more diverse samples. To further clarify this, we have added a sentence to this effect in the limitations section. (p.28).

Finally, to respond to the question posed in the final sentence of the paper, the growing appeal of Nature Rx would suggest that these benefits can come even from activities or programs that are prescribed (see, for example, Alexander and Brooks, 2021: https://doi.org/10.1016/j.colegn.2021.03.001).

We do acknowledge work on the social prescribing of nature, more broadly, in our introduction, but thank the reviewer for highlighting this particular work. It looks like an interesting addition to this literature but unfortunately we were unable to access it as it is not open access and appears to be directed toward the Australian Nursing Community? The references suggest it addresses a much more wide-ranging body of outdoor activity than our study (i.e. looking at outdoor spaces and population groups from urban parks and green spaces to gardening and from children to adults), though not specifically wilderness areas. We will continue to try to access the paper and agree that further work on wild spaces might make a useful addition to this body of literature.

I enjoyed reading the paper and hope to see it revised and published. It promises to contribute nicely to ongoing scholarship about therapeutic landscapes and how and why they influence people the way they do.

Thankyou

Reviewer #2: Thank you for the opportunity to review this manuscript, which presents an informative qualitative study exploring older people's understanding of wilderness, their experiences of nature-adventure in wilderness settings, and the impact of these experiences on their well-being. The manuscript is thoughtful and relevant. However, a number of aspects require some clarification and further improvement. We have listed these in-detail below. In addition, the overall writing needs some refining to enhance clarity and readability. Sections were quite dense and at-times difficult to 'wade through'.

Thank you.

ABSTRACT
1. Please provide additional methodological details in the abstract (e.g., sample n, age range and average).

We have added detail on the number of participants and their age range in the abstract. (see highlighted text in abstract)

2. Make sure claims of abstract are backed up in the main text. Some promises fell a bit short, and these are big/important bodies of theory and literature to engage with simultaneously (e.g., embodied, relational).

Our paper engages with ideas around relationality and embodiment as commonly referred to within the TL literature (see p.4 and 6). We are not claiming that the paper engages with these concepts beyond the TL framework, so we are not quite clear here what further the reviewer is suggesting re the abstract?

INTRODUCTION

3. Authors could improve the flow of the paper so it's easier for readers to make a connection between the background/core concepts towards the study aim/objectives, findings and implications.

We are unclear what specifically the reviewer is referring to here (and R1 indicates they *found 'the paper is well-written, clear, and engaging')*. However, with this in mind, we have re-read the paper and sought to further improve the flow throughout.We have also made the rationale for our focus on defining wilderness clearer (see response to R1 pp5-6).

4. Expand the Ageing and the therapeutic landscape section by including a broader rationale about why it is timely and necessary to focus on an older population. For instance by answering the following questions: Why is it important to address the knowledge gap of the health and wellbeing effects of nature-adventure among older people? What does the literature indicate about how therapeutic landscapes may change with ageing? What are the broader public health implications of the findings?

Thank you for raising these points.

Regarding Point 1, we felt that we had addressed this in our section on Nature Adventure in Later Life where we stated:
While the beneficial effects of the natural environment have been explored for a wide range of different population groups (from children to adults and for specific health issues ranging from obesity to poor mental health), the health and wellbeing impacts of nature-adventure for people in later life and the effects of ageing and lifetime involvement have received only limited attention [REFS]. We are unclear if the reviewer is looking for something more here?

Regarding point 2: As we note in our response to point 7, we did not set out to specifically focus on older people, rather our convenience sample turned out to all be over 50 years of age and some of the issues they raised about their engagement with nature-adventure activity in relation to their ageing, we felt were interesting and important to draw out in the paper.

We are very conscious of word length and so have sought to keep these introductory sections as tight as possible, hence we opted for interlinked introductory sections on our three main themes: defining what we mean by nature-adventure activity; engaging with nature-adventure activity in wilderness in later life; and our conceptual framework around wilderness and therapeutic landscapes. We have included some relevant work around older people, natural landscapes and TLs in our second section but feel it is beyond the scope of this paper to go beyond that. However, given that most of this literature does not engage with how TLs change in later life, this is something we have returned to in our discussion/conclusion as is point 3. (see pages 2,4,5-6).

5. Authors state 'there has been very little focus on understanding the mechanisms through which [physical health and wellbeing benefits of nature exposure] are affected' (p2, l14-17). Agree with authors that a deeper understanding of the mechanisms that account for observed health effects is

needed. However, there have been significant contributions from both epidemiology and therapeutic landscapes scholars that are not currently considered in the manuscript [see 1-5]. A deeper reflection on this literature is needed to frame the overall study (particularly on the study's introduction, general discussion and implications).

Given the breadth of literature on Therapeutic Landscapes, work within environmental psychology and public health around green/blue space etc. we had to make some judgement calls about which literatures to include/exclude, and we are very aware that some important papers may have been missed out. We have read the papers that the reviewers have suggested with interest and have included reference to those we felt were particularly relevant (Foley, Finlay and Pitt and one or two others that these papers led us to) – the Pitt paper we felt raised issues around the moving body and therapeutic landscapes that we felt were particularly important to engage with. Our thanks to the reviewers for pointing these out to us. (see pages 2,4,5-6)

6. In the Aims and objectives section the authors indicate few studies have focused on older people's definition of 'wilderness', however, the intricacies of providing a definition have not been mentioned in the previous sections of the introduction. Suggest authors emphasize why a definition of wilderness from the participants' perspective is necessary.

Thank you, we have addressed this issue - see response to R1's comments above. (pp5-6)

METHODS

7. Did all participants self-identify as 'older adults'? Authors should clarify and justify their definition of older adults and why a 'younger' sample from the WHO global definition of older people (60+) or that established in the UK (65+) was considered appropriate and what are the implications for the findings.

Thank you for highlighting this. In fact, we did not set out to specifically focus on older people, but our convenience sample were all aged over 50 years of age and raised some interesting life-course and later life issues that we felt worth exploring. We have therefore removed reference to older people instead referring to those in their later life and added a brief paragraph to acknowledge and explain this in the paper. (see Title, abstract, p.9 and throughout the paper)

8. It would be useful for authors to clarify their start-end dates of data collection. Also, it is unclear if any focus groups were carried out previous to COVID-19 restrictions and the decision to adapt the methodology to in-depth interviews.

Interviews took place during March/April 2020. No focus groups took place as the Covid restrictions were introduced before we were able to start any Focus Groups. This has been clarified in the text. (p.8)

9. Clarify which were the main topics covered by the interview. As it stands, it is unclear how the themes were derived from the data and/or if themes were identified a priori? Could provide interview topics/themes and protocol questions as supplementary material.

Our interview guide has now been included as supplementary material – see Appendix 1

10. It is also necessary for authors to indicate what methodological thematic analysis approach was followed and to provide citations accordingly.

We have inserted reference to Braun and Clarke's approach to thematic analysis. (p.8)

11. It would be useful for authors to clarify a few additional methodological issues, for instance, what principles informed the sample size? What was the approximate duration of the interviews? Who/how many researchers participated in data collection, coding and writeup, etc.

We have inserted further details related to each of these methodological queries. (pp.7-8)

12. The section does not mention why vignettes were selected and how they choose which participant stories to highlight, which are important methodological details.

The vignettes were selected as they provided slightly different insights into how and why participants engaged with nature-adventure activity in wilderness settings in ways that we felt were most illustrative of the broader findings. We have included information to this effect. (p.18)

13. Would suggest authors add some reflexivity information regarding their own roles, potential bias and influences during the formulation of the research questions, data collection and interpretation.

We are conscious of word length and that a full discussion of reflexivity could add considerably to this. We do however recognise the importance of understanding the positionality of the research team and have hence inserted a brief paragraph at the end of the methods section to explaining this, allowing readers to understand the influences our backgrounds bring to the interpretation of our work. (pp 9-10).

RESULTS

14. The authors have provided a good balance between themes, descriptions and citations. Moreover, the themes 'routes into nature-adventure activity' and 'ageing and nature activity' provide important details to advance our understanding into life-course entry points to nature activities and what factors enable/hinder this engagement among ageing populations.

Thankyou

15. The authors have also hinted into a few very relevant aspects of participants' resilience and counter arguments for ageist discourse [for instance in Isla's description of constantly seeking a 'challenge' and how this translates into a quest to learn and try new things] [p 8, l 30-33]. Recommend authors highlight this finding in the discussion section.

Thankyou. We have now added this finding in the discussion section p.26.

16. The notion about fear of becoming a burden to the group is quite interesting- were there any indications about older participants shifting towards more solitary or group activities as they age?

Thank you for raising this issue. We did not find an indications of individuals purposefully shifting to individual or group activities as they aged, but acknowledge that we were only drawing on a relatively small sample and this would certainly be worth exploring in future research. We have thus added a sentence to this effect in our conclusion. P.28.

17. The factors and enablers are not necessarily mechanisms, at least as currently conceptualized and framed. This needs some refining for clarity and strength of argument.

We are unclear which part of the paper this comment refers to – we assume it refers to Figure 3 and agree that the figure illustrates the factors with the text better describing the mechanisms going on underneath, We have thus amended the title of the model to reflect this. (see Figure 1).

18. Was there any participant discussion of COVID-19 during the interviews or new/shifting findings given the COVID-19 pandemic? (E.g., did engagement in these activities become more/less

important, varying abilities to engage or not given public health restrictions and social distancing recommendations, shifting wellbeing outcomes)-

Thank you for this comment. Our data focussed on reflections of experiences – and the data collection took place in the early stages of the first Covid-19 lockdown. As a result, people were still assuming it would be a temporary thing. Given participants were talking retrospectively about their experiences, while one or two people did comment on how Covid-19 had temporarily limited their access to wilderness, it wasn't a major focus of the interviews and as such we chose not to engage with what little data we had on it in this paper. We agree that it would be really interesting to understand how experiences have changed since, and how people have adapted – but that would be for a follow-up study.

DISCUSSION

19. (p13, l51-53): It is unclear how much beliefs and perceptions of ageing were prompted for in the interviews or how they emerged in the themes?

We have included the Interview Guide as supplementary material in Appendix 1

20. It would be useful for authors to reflect on the implications of moving their research to online interviews (i.e., technology or access barriers for participants?).

Thankyou. Interestingly, moving to video-conferencing rather than face to face interviewing made no difference to our research. We suspect this is because our sample came largely from a middle-class background and where hence familiar with online social networking programmes. We have indicated this in our methods section. (bottom of p8).

21. As noted in #18, important for the authors to add reflection/discussion, if possible, on how COVID-19 may have impacted the participants' responses (and if this topic was discussed upfront with participants or emerged in conversations).

See our response to #18

22. A wider and critical discussion of the study limitations is needed.

We explicitly state that there are a number of limitations to the study and the interpretation of the results need to be seen within the context of these limitations. As such our findings and model can only be seen as a starting point for future work. We have included this section below. We are conscious of word limit so are not sure what else the reviewer would want us to add.

We do however acknowledge the study's limitations, in that it draws on data from a fairly small convenience sample of those aged over 50 years from one specific area of 'wilderness' in the UK, all of whom can be largely defined as white middle class professionals. As such we are acknowledge the lack of diversity within the study and that the interpretation of our findings need to understood within the context of these limitations. Any future research drawing on this work needs to consider this. As a result of these limitations, we acknowledge that our model can only be seen as a starting point – one that should be refined and revised as further research is undertaken with a more diverse sample of participants. (p.27)

CONCLUSION

23. Would suggest authors reframe their results in the larger body of therapeutic landscapes research, so that a more modestly framed contribution can facilitate identifying how and why their findings are useful for public health interventions and further research.

Thank you for this suggestion, we have refined our conclusion to draw out the health/public health implications of our work. M(pp 28-29)

TABLES & FIGURES

24. Table 1. Quite interesting that most participants engage in multiple nature activities. If the authors collected information regarding encounters frequency or time of exposure (duration of encounters) this would make a valuable addition in this table and to further expand the contextual factors towards health & well-being.

Thankyou for raising this point, as this was a small retrospective qualitative study we did not collect data on frequency or time of encounters so are unable to report on this.

25. Figure 3. It's a worthwhile endeavor to attempt to provide an accessible figure to understand the pathways leading to well-being through nature adventure activity. However, the current figure is quite hard to understand. The clip art imagery is confusing and distracting. A more traditional diagram might be preferable to the current format (see example from Lachowycz and Jones, 2013), or if possible work with a graphic designer to professionalize and enhance the figure imagery

Thankyou for this suggestion, we specifically wanted to avoid the more diagrammatic approach to our model in favour of something we felt would be more 'easily digestible' and visually appealing. We have however revised the model in the light of the comments made above. (see Fig 1)

Wilderness as therapeutic landscapes in later life: towards an understanding of place-based mechanisms for wellbeing through nature-adventure activity

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Abstract

While there is considerable evidence that therapeutic landscapes have a positive impact on wellbeing, we know little about the mechanisms through which this impact occurs. In this paper we go some way toward addressing this gap. Drawing on in-depth interviews with 12 people aged between 52-75 years of age, who are engaged in nature-adventure activity in the UK, we focus on what they understand by 'wilderness'; their experiences of nature-adventure in wilderness settings; and the impact of these experiences on their wellbeing. Moving beyond the largely behavioural focus of laboratory-based studies prevalent within environmental psychology, we highlight the importance of understanding the role of the contextual in the therapeutic relationship. That is, *how* relational, embodied, social, lifecourse and/or cultural factors that are constitutive of wilderness environments impact wellbeing for those engaged in nature-adventure activity in later life. In doing so, we map out a working model of the mechanisms that impact wellbeing within this context. Our data suggest that there is no one single mechanism, rather we need to think about a range of mechanisms, often operating across a series of spectra (active/passive; safety/risk; alone/socially etc) and importantly, each are connected to place. Hence, we suggest, that where that activity takes place is instrumental for wellbeing.

Keywords: Therapeutic landscapes; later life; nature-adventure activity; wilderness, mechanisms.

Highlights

- Addresses critiques of Therapeutic Landscape for its failure to address why natural landscapes are therapeutic
- Maps out some of the mechanisms that underpin how Therapeutic Landscapes impact wellbeing
- Explores the impact of nature-adventure activity and how people adapt their activity in wilderness for wellbeing in later life
- While the activity is important, where that nature-adventure activity takes place is instrumental for wellbeing in later life

Wilderness as therapeutic landscapes in later life: towards an understanding of place-based mechanisms for wellbeing through nature-adventure activity

Introduction

Globally, there has been increased recognition within public health discourses of the importance of outdoor environments for improving and maintaining health and wellbeing. This has led to increased interest in wilderness-based therapies and mental health policies that seek to endorse the inclusion of outdoor activities in mental health services and the social prescribing of nature (see Howarth et al 2020; Bragg and Leck, 2017; van den Berg, 2017). The shift toward promoting nature-based encounters is underpinned by a growing evidence base for the beneficial health and wellbeing effects of engaging with, for example, green and blue space (Bell et al, 2014; Wood et al, 2017; Volker and Kistemann, 2015); forest schools, green gyms and trim trails (Coutts, 2016; Kim and Miller, 2019); and a range of other outdoor sporting activities (Loureiro and Veloso, 2017). At the more extreme end of the spectrum we have seen a growth in the uptake of 'nature-adventure activities' – a term used to define voluntary engagement in novel, uncertain and emotionally intense recreational activity (Boyes, 2013). Nature-adventure activities range from mountaineering and rock climbing to skiing, fell and ultra-running, mountain-biking, long-distance cycling, wild swimming, wind-surfing and more. Integral to these types of engagement is that they involve challenging physical activity either in, or on, the natural environment. Related terms include 'outdoor adventure' (Hickman et al, 2015), 'alternative' sports (Humberstone, 2012), adventure tourism and extreme sports (Buckley, 2020). While these terms overlap, the specific term used varies, dependent on the discipline and target audience.

Early work around nature-adventure activities placed risk engagement as central to the experience (Ewart, 1989; Martin and Priest, 1986) with risk, danger, uncertainty and the emotional response to fear being interpreted as fun, thrill and excitement (Stranger, 1999). Cater (2006) maintained thrill and excitement were the prime motivations for such engagement. However, in recent decades, these factors are increasingly viewed as being of less importance than the benefits of wellbeing, pleasure, learning and embodied experience gained through the emotional, social and environmental engagement with nature (Buckley, 2020).

Nature-Adventure Activities in Later Life

The beneficial effects of the natural environment have been explored for a wide range of different population groups from children to adults and for specific health issues ranging from obesity to poor mental health (e.g. Kearns and Collins, 2000; Barton and Pretty, 2010; Havlick et al, 2021). There is also a small but growing literature on the relationship between older people and everyday therapeutic landscapes (e.g. Milligan et al, 2004; Finlay et al, 2015; Mossabir et al, 2021). However, the health and wellbeing impacts of nature-adventure and the effects of ageing have received only limited attention (though see Gomez-Pinilla and Hillman, 2013; Lee et al, 2017, DiPietro et al, 2017; Vivar and van Praag, 2017). By providing opportunities for euphoria as well as exercise, Buckley (2020) argued that nature-adventure activities can lead to substantial improvements in resilience and in the physical, mental and social health of people in later life. He maintains that these benefits can extend even where physical and/or mental capabilities have decreased, as an outcome of a person's adjustments in their expectations. Furthermore, the euphoria gained from such activities, Buckley suggests, can temporarily override the chronic pain and psychological stress often associated with other

aspects of ageing. For others (e.g. Dionigi, 2010; Humberstone, 2011; Wheaton, 2017), participating in nature-adventure activities does not mean that older athletes ignore the onset of later life, rather, through their pursuit of nature-adventure activities, they construct a sense of self, identity and environment through embodied sentient practices, whilst at the same time, challenging notions of what it means to be old.

Despite the growing number of studies identifying the physical health and wellbeing benefits of nature exposure, most measure a limited set of parameters and through relatively brief low-level involvement. Importantly, there has been very little focus on understanding the mechanisms through which these impacts are realised. In this paper we seek to address some of these gaps. Drawing on data from a small qualitative study, we focus on *how* active engagement with wilderness through nature-adventure activities impacts the wellbeing of people aged over fifty years in the UK. Before doing so, however, we draw on previous work exploring person-place relationships and their importance in conceptualising the impact of engaging with wilderness through nature-adventure activity.

Wilderness as therapeutic landscapes

Although significant work has been undertaken across a range of disciplines, perhaps the most intensive research into the healing or restorative properties of the natural environment has been in the field of environmental psychology. These perspectives have largely been dominated by Kaplan and Kaplan's (1989) attention restoration theory (ART) and Ulrich's (1984) psychological stress reduction framework. According to ART, directed attention is the cognitive mechanism that is restored by interactions with nature. The attentional capacities of individuals are viewed as being separated into two components: involuntary attention, where

attention is captured by inherently intriguing or important stimuli; and voluntary, or directed attention, where attention is directed by cognitive control processes. According to ART, interacting with environments rich with inherently fascinating stimuli, such as natural environments, invokes involuntary attention modestly allowing directed attention mechanisms a chance to replenish (Van den Berg et al, 2003). In a similar vein, Ulrich's psycho-evolutionary model maintains that natural environments can facilitate enhanced stress recovery and attentional fatigue, with the potential to foster restoration from anxiety by virtue of their ability to trigger positive emotional responses (Ulrich, 1979; Parsons et al 1998).

In exploring the wellbeing benefits of 'natural' landscapes, environmental psychologists have largely focused on the extent to which natural environments elicit stronger restorative effects than urban or artifact-dominated environments. These studies have been largely quantitative in nature, seeking to measure mood states, blood pressure and stress hormone levels whilst presenting participants with photographs or video clips of rural and urban scenes in laboratory settings (e.g. Parsons et al, 1998; Korpela et al, 2002; Van den Berg et al., 2003). Interestingly, Stevenson et al's (2018) review of ART literature highlighted evidence of the enhanced restoration effects of exposure to *real* versus *virtual* or lab-based environments. ART, however, has been criticised for taking a relatively passive approach to person-place interaction (Pitt, 2014) – one that largely fails to consider the significance of the place/bodily activity interaction; and the significant diversity of outcomes within ART research (Ohly et al. 2016), making it difficult to draw firm conclusions across this body of work.

Whilst environmental psychology perspectives are useful in drawing attention to the nature/person/wellbeing relationship, arguably, they fail to account for the contextual (i.e. the relational, embodied, social and/or cultural) factors that are constitutive of the relationship

between the natural environment and wellbeing. This is a critique often made by the Therapeutic Landscapes literature which has an idiographic concern with 'thick description' and hence: a) is qualitative in nature; and b) focuses on the relationality between people and the physical, social and symbolic aspects of places that contribute to wellbeing (Kearns and Milligan, 2020). In recent years, therapeutic landscapes has emerged as a dominant framework within health geography and beyond, for organising ideas around people's experiences of place and how these experiences impact health and wellbeing (DeMiglio and Williams, 2008).

The therapeutic landscape literature has also engaged with ideas around remote places, wilderness and wellbeing (see Wilson, 1992; Palka 1999; Milligan and Bingley 2007). While Milligan and Bingley's (2007) exploration of the restorative potential of woodland highlighted both positive and negative impacts that warrant consideration at the individual level, Wilson's work on cultural narratives of landscape in the North American context, revealed how encounters with wilderness offered up possibilities for personal renewal. This theme was further explored by Palka (1999) in his work on national parkland in Alaska, where he considered the therapeutic properties of wilderness that had remained largely untouched by humans. While such wilderness areas are now increasingly rare, of relevance here, is the way his work engaged with the notion that these landscapes offer peaceful and harmonious settings conducive to the provision of a healing experience for those that visit them. Defining wilderness, however, is notoriously difficult, and whilst some formal definitions exist (such as the US Wilderness Act 1964), most stress the natural state of the environment together with the absence of human habitation and other human influences (Carver and Fritz, 1995). Because the idea of wilderness is largely one of personal experience and perception, they maintain, identifying the point at which wilderness begins, in absolute terms, is subjective. Hence, to understand *how* the therapeutic relationship between wilderness and wellbeing unfolds, it is

important to understand what wilderness means to the individual engaged in that relationship. A small, but relevant, body of work, within the therapeutic landscapes literature is linked to the role of specific activities within wild spaces. Foley's (2015) work on wild swimming and therapeutic blue spaces, for example, while not specifically focused on those in their later lives, does highlight the importance of the embodied experience, where participants describe not just the visual aspects of the landscape but also their emotional response to it, the physical experience of the activity both in and on the landscape (including fatigue, sore and aching muscles etc) and the body's kinaesthetic response. Pitt's (2014) work, though focused on community gardens rather than wild spaces, makes an important contribution to the field here in that it points to the importance of bodily motion in the therapeutic landscape encounter. Pitt argues that with few exceptions, the moving body has been neglected in both this and the ART literature, and that *what* people do is as significant as where these activities take place. The activity, she maintains, is therapeutic not through a person's passive presence in place but through moving in ways that are conducive to intensely focused moments of absorption in particular skilled rhythmic activities.

In conceptualising mechanisms within the context of wilderness, wellbeing and nature adventure sport in later life, we draw on the work of Astbury and Leeuw (2010) and Vassilev et al, (2014) to take a 'realist' informed approach, defining them as those underlying entities, processes and structures which operate in particular contexts to generate wellbeing. They are shaped by the environments in which they take place, which can be enabling or disabling depending on the capacities they offer for supporting relational actions or activities beneficial to people's health and wellbeing. In adopting this approach, we seek to offer a conceptualisation of the mechanisms that underpin or explain the therapeutic potential of wilderness experiences, whilst also eliciting the relational context between wilderness / wellbeing (something that is often overlooked by ART approaches).

Aims and objectives

Despite the emerging literature on later life, nature-adventure and wellbeing, there are only a handful of qualitative studies that focus on the topic and many unanswered questions remain. For example, we know little about what kinds of engagement works for whom, how these impacts are realised and how people in their later lives define wilderness in relation to their wellbeing. Critically, the *how* question remains unanswered. Our aim was thus to begin to map out some of those underlying place-based mechanisms that contribute to wellbeing through nature-adventure activity. We do so though analysis of a small investigative study with the objective of understanding: i) how people in their later lives (for the purposes of this study referred to as those aged over fifty years) define and understand wilderness; ii) their experiences of nature-adventure in wilderness settings; and iii) the impact of these experiences on their wellbeing.

Method

The study involved twelve participants aged fifty years and over who chose to spend their free time engaging in wilderness-based nature-adventure activities in the UK. All participants were recruited from the north west of England, an area close to the Lake District National Park whose proximity to mountains, lakes, the sea and remote areas is ideal for engaging in nature-adventure activities. As we were specifically interested in those people who were already engaged in these activities, we approached organised activity groups within the area to identify potential participants who regularly engaged in nature-adventure activities. Additional participants were then recruited through snowballing techniques. Those expressing interest

were sent an information sheet explaining the study and what participation would involve. As an exploratory study, the sample size was determined by both theoretical sufficiency (Vasilieu et al, 2018) and the pragmatics of available resources. While initially a series of focus groups had been planned, the introduction of Covid-19 restrictions in the UK in March 2020 (just before we were due to begin data collection) meant face-to-face and group data collection was not possible. To enable our research to continue within the new socially-distanced environment, we adapted our approach to that of semi-structured interviews undertaken through video-conferencing. Participants were sent the topic guide in advance of the interview (see appendix 1), with interviews lasting between 40-60 minutes. Interviews were undertaken between March-April 2020 by three members of the research team members (authors 1,2 and 4) with author 2 undertaking the bulk of the interviews. All three interviewers used the same topic guide (see Appendix 1). Following written informed consent, all interviews were recorded and transcribed in full. The data were analysed using Braun and Clark's (2012) thematic analysis supported by Atlas/ti qualitative software. As part of this process, all four team members read and open coded a number of interviews each. The open codes generated from this process were then reflected on, discussed and refined in online team meetings until agreement was achieved regarding the emergent major themes.

Participants were offered a range of video-conferencing options and were able to select the platform with which they felt most comfortable. They were also offered the option of a telephone interview although none chose this option. None of our participants experienced any difficulties in adapting to the online interview approach, which may well reflect the largely middle-class backgrounds they came from (see Table 1).

The research received ethical approval from XX X on 23/01/2020.

Our convenience sample were all over fifty years of age (see Table 1). While we did not set out to specifically recruit from this age group, it became clear that this was an interesting group to explore as our sample were drawn from those who were biologically fit enough to physically engage with the outdoors, whilst chronologically old enough to be at increased risk of physical and mental health problems. However, acknowledging the challenge of referring to our sample as older people, we chose to refer to them as those who are in their later lives.

As illustrated in Table 1, participants ranged in age from early-50s to mid-70s with an average age of 61 years and included seven women and five men. Pre-retirement, most participants had held skilled or management-type occupations, suggesting a good level of education in their earlier lives. Most engaged in more than one nature-adventure activity with cycling/mountain biking, climbing, skiing and ultra-running being the most common forms of activities.

INSERT TABLE 1 ABOUT HERE

Reflecting on the influences of the research team, authors 1 and 3 come from health geography backgrounds and along with author 2, have an interest in therapeutic landscapes and furthering our understanding of the relational mechanisms between people, place and wellbeing. As such, all three researchers were primed to draw out the importance of context. Author 4 is a clinical psychologist whose work focused on mental health and training in mindfulness. As such, her interest was on drawing out beliefs about ageing and the impact of nature-based activities on

present moment awareness. Authors 1 and 2 also have a background in ageing and wellbeing and as such were sensitive to changes over the life span.

Findings

Defining Wilderness

Whilst acknowledging that there was no 'real' wilderness left in the UK - perhaps with the exception of a few remote parts of the Scottish Highlands - participants identified a set of characteristics that were important to them as they sought out places in which to engage in their nature-adventure activities. Key physical features of wilderness activity spaces included unmanaged or less manicured landscapes (often mountainous) or sea/waterscapes where there was no, or limited, evidence of human impact and technology such as a phone signal. Such environments were described as 'back country', remote and devoid of people. Key to our participants' sense of wilderness, was that it required them to be away from civilisation, a long way from help and modern conveniences. These characteristics echoed those earlier definitions of wilderness identified by Carter and Fritz (1995). However, being remote and devoid of civilisation was not sufficient. Characteristics of quietness, beauty, and being a habitat for wildlife were also important, as were participants' affective responses to wilderness. In particular, participants referred to wilderness as having the ability to engender feelings of wonder, alone-ness, excitement, fear and terror.

> *Wilderness for me is something inside that I feel when I'm out on the hills. Yeh, so it's nothing to do with if you like, the environment; it's about how I feel yeh. .. For*

me, the top of a mountain, dark at night with a little head torch where I'm terrified, that would be Wilderness. [Carol, 70]

Routes into nature-adventure activity

Critical to understanding the mechanisms that facilitate people's wellbeing through nature-adventure activity in later life is an understanding of how engagement with nature-based activity in wilderness settings is initially stimulated and how it is sustained over time. Our data suggest a number of different routes into nature-adventure activity that can largely be grouped into four categories:

i) Formative childhood or youth experiences: often stimulated though activities undertaken with, or encouraged by, parents, or community groups such as the scout or guiding movements, school, college or university activity groups;

ii) Work or volunteer activity in young adulthood: e.g. joining the armed forces or other active employment, undertaking self-development activities such as Outward Bound courses or enrolling in the Duke of Edinburgh's scheme (https://www.dofe.org/) etc;

iii) Friends or relations: being encouraged to participate by a partners, friends or neighbours who already engaged in nature-adventure activity and provided the 'support' to stimulate that initial engagement;

iv) 'Critical moments' in the lifecourse: events that stimulated a change in lifestyle, for example, moving to an area that made wilderness engagement more accessible, or

significant life-changes resulting in a re-thinking of priorities and how that person's life would be organised such as retirement, bereavement or a health scare/awakening.

..we would go for walks in the Peak District with mum and dad so that was not real Wilderness but still little 'mini Wilderness' for little people. So that was from the age of 5 or 6. [Fiona, 52]

Most of these 'routes in' to nature-adventure activity are based on wider contextual factors that can be seen to have stimulated participants' long-term socialisation into the activities and into promoting an appreciation of the wilderness landscapes in which the activities are conducted.

I suppose I was fairly sedentary and bit of a geek at school, but I got into the Duke of Edinburgh. So just the walking through the wilderness was really great for me. At the end of school I had an expedition trip with my Duke of Edinburgh friend in Sky and got myself into problems on, what are pretty tricky mountains for this country …so when I went to university I said, well let's learn a bit about climbing. So I joined the climbing club … and I suppose I defined myself as much by adventure and climbing and my activities, from that point. [Jim, 58]

However, as the fourth category suggests, one mechanism that can trigger people's engagement with nature-adventure activity in wilderness landscapes is linked to more personal lifecourse or behavioural events.

I didn't start [ultra] *running until I was 60, when I retired, and I had never done anything like that before. … But the way it made me feel to start with, once I achieved something and I thought ooh I'm part of this group and I'm really enjoying this, it just makes you feel so good about yourself.* [Carol, 70]

Carol's decision to take up ultra-running was linked to having more time in retirement, a partner already engaged in various forms of nature-adventure activity, and the desire to combine her love of wild spaces with an activity that brought her a sense of achievement and a sense of being part of a social network of like-minded people.

Ageing and nature-adventure activity

Whilst an understanding of what stimulated initial engagement with nature-adventure activity is important, it is also vital to understand why older people continue to engage with (or even newly take-up) nature-adventure activity, as well as how this engagement can change, with increasing age. Buckley (2020) pointed to the importance of a sense of euphoria for sustaining engagement with nature-adventure in wilderness in later life, and the data from our participants certainly reflected this, but our study also suggested that nature-activity activities need to be linked to adventure, risk and fun (Cater, 2006).

A lot of it was the Wilderness aspect, to actually be out on the lake with the most fantastic views at the level of the lake itself. Just have this sort of wonderful feeling of being in the middle of nature. [Lesley, mid-60s]

If I'm honest, I think I like risk. If it was risk free; if it wasn't some element of danger I wouldn't be so interested. Not that I've got a death wish or anything like

that; so the natural world here is the true meaning of adventure. I like to do things where you don't really know what's going to happen. Yeh, so wilderness is adventure for me. [George, 52]

Our participants' excitement and pleasure engendered through risk and uncertainty and the embodied experience gained through the socio-emotional and environmental engagement with nature reflects the known experiences of younger adults (Cater, 2006; Buckley, 2020). However, our participants also recognised the limitations that their ageing bodies placed on their engagement with nature-adventure activity.

So I do go climbing but I will do the easier stuff now because I haven't got the strength to do the harder stuff. Plus I've lost my head for confidence at height again…I find it physically harder now I'm older; I have to face it. [Katherine mid 50s]

This did not represent a withdrawal from nature-adventure activity in favour of gentler forms of sport and exercise; rather it led participants to look for ways in which to overcome age-related limitations. In particular, they referred to relying more on technique than strength; recognising the challenges of the ageing body but looking for solutions to enable them to continue participating in their preferred nature-adventure activities and sharing those solutions with others.

I think when you're experienced, it's all to do with, I would like to say wisdom …of having experienced various situations that you know, that you need to have preparation for, or you need to be more cautious… the body isn't designed to go at

the rate it did all those years ago and so it's planning in advance for what you can still do, while still pushing it as far as you can, I think. [Elizabeth, 62]

For some, adaptation involved taking up new nature-adventure activities that still presented the mental and physical challenges important to their engagement with wilderness, but which better accommodated the limitations of their ageing bodies:

Isla [55] *Now I've got quite a lot of arthritis I do quite a lot of open water swimming, which is quite new for me. If 10 years ago someone said I was going to be throwing myself in cold water, I would have laughed in their faces then. I find it similar to being out on a hill without hurting so much anymore* (laughs)!

Int: *So it's similar?*

Isla: *Yes it is. Something about the challenge, I don't know... there's the feeling, the being out there. I found open water quite scary and I wasn't a great swimmer, I had to learn to swim properly.*

The importance of such activities for both enhancing and enabling a person's sense of self in later life, as well as their emotional and social wellbeing, led our participants to look for less challenging ways of engaging in nature-adventure activities. In some instances, it was about accepting that while it was still possible to participate, the taking part and completion of the activity was now more important than the competitive element. As Carol [70] put it, '*My goal is to finish the events; so to complete them rather than compete. I can't compete with the youngsters but I can finish them'.*

Hence people's preferences for nature-adventure activities can change over the lifecourse. Buckley refers to this as 'leisure lifepsychle' (2017, p.95) that reflects the psychological trajectory of ageing, highlighting two major thresholds in people's nature-adventure activity in later life linked to self-esteem. Firstly, when that person realises that younger friends and colleagues are now more skilled than they at the activity, so they are no longer 'leaders'; and secondly, when they realise they are no longer able to keep pace and have become a burden to the group, but are respected for their past achievements rather than their current capabilities. In these circumstances the person needs to reassess their achievements to avoid loss of self-esteem.

Wilderness as a therapeutic space

While the importance of exercise for maintaining health and wellbeing, and the role of green and blue space as settings for that exercise is well acknowledged, what is less clear, is how wild spaces, as sites of nature-adventure activity, facilitate wellbeing. It could be argued, for example, that seen purely as a form of exercise many nature-adventure activities could equally well be undertaken in urban settings, indoor fitness centres, running tracks, swimming pools and so on. Indoor climbing walls and artificial ski slopes may even be argued to offer safer and alternative spaces for individuals to continue engaging in their chosen nature-adventure activity as they age. What our data illustrate however, is that wild places hold specific sensory and visual attributes that are key to how an individual successfully engages with their chosen nature-adventure activity and these underpin the mechanisms that facilitate wellbeing. For Isla, for example, it is the physical and emotional relationality in which the ***combination*** of the wilderness landscape and nature-adventure activity contribute to a sense of self, exhilaration and personal achievement that is important and could not be gained from an urban setting:

I think I like it when there is a bit of a challenge; just going and sitting in a beautiful [urban] *park wouldn't give me the same thing, even if there was nobody around. It's something about having made some effort to get there. ..... I definitely feel that the getting out, the feeling of achieving something, managing your own fears, your physical failings but succeeding, yeh ... and in the wilderness so much is down to you. There aren't people around, there's nothing going to kind of suddenly step up and go hey! you know, let me take your hand, this is all over. It is down to you; you have to make those decisions.*

For Jim, it was the active engagement with nature and wilderness rather than a passive 'managed' engagement that was key:

...it could be around a very strong wind; it could be around a very powerful waterfall; you are seeing elemental forces and by seeing them, being close to them more powerfully, I think it's deeply impacting and engaging with it rather than standing with a crowd at the other side of the bannisters in front of Niagara Falls, is very, very different, a very different experience.

This combination of the nature-adventure activity experience and the characteristics of wild spaces were viewed as important contributors to how participants' wellbeing was positively impacted. As Helen commented:

Maybe it helps you sort of reset a bit I don't know really. ...The more I think about it the more I think it is a combination of things that makes me feel that it's a positive thing for my wellbeing. It's the sense of challenge; it's the adrenalin rush if you like of doing something quite energetic ...it's that buzz and it's the fact that you are in

a sort of wild place with little sign of other humans, if you know what I mean, not a crowded place. For me I think it is that combination of things really.

Other participants highlighted the importance of the challenge that the landscape itself presents, requiring them to focus their attention and view the landscape differently in order to successfully complete their activities, whilst at the same time absorbing the sensory aspects of wilderness.

Nature-adventure, ageing and wellbeing

Our data suggest that the mechanisms that facilitate wellbeing in participants appear to differ dependent on the form of nature-activity engagement with wilderness. For some activities, such as rock-climbing, mountain biking and windsurfing, the challenge and level of skill required to complete the activity successfully requires a 'clearing of the mind' in order to enable them to concentrate and focus fully on the task at hand. This absorption with a particular nature-adventure activity leaves no room to focus on other issues that may be negatively impacting an individual's wellbeing. To illustrate how the wellbeing impacts of people's engagement with wilderness through nature-adventure activity in later life varies, and the mechanisms that can contribute to these relational effects, we draw on two vignettes. These vignettes were selected as they provided interesting but differing insights but overall were illustrative of the broader findings emerging from the study.

Figure 1 *Vignette: Andrew (68)*

Andrew is a former architect who moved to the Lake District 30 years ago as he found his previous place of residence (a smallish city) had become too 'urban'. His nature-adventure activities include mountain-biking, cycling, mountaineering, skiing and windsurfing. Though he hasn't windsurfed for many years, he views it as his 'first love' but changed to mountain biking some years ago when he became

fed-up having to continually wait for 'the right' conditions to windsurf. Mountain biking, he feels can be done anytime, with wet conditions only enhancing 'the challenge'.

Andrew loves the 'challenge' and adrenaline rush he gets from nature-adventure activities. He believes that specific types of nature-adventure activities, such as mountain biking, windsurfing and mountaineering are good for his mental health, especially when he is experiencing a period of anxiety and depression. He maintains they require both mental and physical engagement in ways that leave no room for him to focus on his anxiety and depression. He compared this to walking and road biking which, while having their own wellbeing benefits, did not require the same combination of mental concentration and physical engagement. Rather, he felt that these types of activities allowed him the 'mental head-space' to work through 'knotty issues' that he was unable to resolve 'in the office'.

Andrew maintains that he would not have gained the same benefits from exercising in an indoor space such as a gym, where the body becomes physically exhausted, but there is no mental stimulation. Sitting, painting or doing less physical activities in wilderness would also not have the same impact because the dual challenge to his physical and mental capacities would not be fully engaged in the same way.

Andrew's vignette (Figure 1) illustrates how nature-adventure activities have a positive impact on his wellbeing but importantly, different activities are seen to do so through different mechanisms. On the one hand his vignette refers to nature-activities *in and on* wilderness and which require skill and intense concentration (such as mountaineering and windsurfing). Such

nature-adventure experiences act positively through 'filling the mind', allowing no room for him to focus on his anxiety and/or depression. The extent to which this has a long-lasting effect is unknown and would need further exploration. On the other hand, nature activities such as walking or road-cycling *through* wilderness allow for a strenuous physical 'work out' of the body whilst freeing up the mind to work through 'knotty problems' that he has been unable to resolve at home or in the workplace. Importantly wilderness, as a natural place, and the activities themselves were seen to be mechanisms that were critical to how Andrew's physical and mental wellbeing were positively impacted; and active over passive engagement was key. Here there was a clear physical and emotional relationality between the individual, his nature-adventure activities and wilderness.

Our second vignette (Figure 2) highlights the importance of the social aspects of some nature-adventure activities, but also how the impact of ageing can impact this experience – in both positive and negative ways - and how the person adjusts to these new circumstances as they age.

Figure 2: *Vignette: Helen (64)*

Helen is a retired teacher, brought up in the northwest of England, but who moved to a city as a young adult. She moved to the Lake District a number of years ago. Helen's primary nature-adventure activity is mountain and long-distance road cycling but she also skis, canoes and has in the past been a runner, windsurfer and hillwalker. Her route into nature-adventure activity was through her parents, who were keen fell-walkers, and took her mountain walking on holidays as a child. She reflects on the importance of being introduced to wild spaces in childhood and how,

as a teacher, she saw children born and living in cities being intimidated by wilderness.

Helen refers to herself as an anxious person who worries what might happen in wild spaces if she or her partner fell or had an accident. Hence, for her, nature-adventure is a social activity, something to be undertaken as part of a group or led by someone expert in the activity. She also notes some of the negative experiences of wilderness activity she has had when, as part of a group, she has fallen behind and as a result felt as if she has held the group up. At the same time, however, she sees this as part of challenging herself through the activity, acknowledging it is not all 'plain sailing'.

Helen reflects on the importance of the 'buzz', sense of achievement and challenge she gets from nature-adventure activity but notes that she does not enjoy all such activities. For her, it is important to feel secure and 'inside her comfort zone'. While the physical activity of cycling through wilderness clears her mind and helps her 'sort things out', the sensory is also key to her nature adventure activity. She refers to the importance of the 'sense of peace' she gains from a favourite vista on her cycling route, and how she brings this to her mindfulness meditation when at home.

Helen reflects on the difference between nature-adventure activity in wild spaces and the less challenging 'walking for wellbeing' groups who undertake short walks much closer to human habitation; walking or cycling in city parks where traffic noise and large numbers of people inhibit the sense of peace and the other sensory elements which are integral to her nature-adventure experience; and more

sedentary activities such as painting and meditation in wild spaces. For her, the combination of place, openness, quiet and the challenge of nature-adventure activity are crucial to her well-being experiences.

Helen's vignette illustrates not only the importance of providing routes into wilderness engagement early in life, but also how it is the *combination* of wild spaces and her nature-adventure activities that is important for her wellbeing. Like Andrew, the sense of achievement, 'buzz' and challenge are key, but crucially for her, a sense of security and not feeling out of her depth is also important for alleviating her anxiety. Being part of a group, even where this can result in negative (if temporary) experiences, is also important for her sense of security. Finally, Helen's vignette highlights not just the importance of the relationality between the landscape (and the characteristics of that landscape) and the activity for wellbeing, but also how the sensory elements of the landscape are 'stored' to be drawn on in mindfulness meditation in other places.

Discussion

We set out in this paper to address two interlinked issues: firstly, to unpack and model some of the mechanisms that underpin how people's engagement with nature-adventure activity in wild spaces impacts their wellbeing in later life; and secondly, how, through identifying these mechanisms, we can begin to respond to critiques of the Therapeutic Landscapes literature that, with few exceptions, fail to engage with the 'how' questions. Moving beyond the now significant body of literature that demonstrates the impact that both unique and everyday spaces

can have on health and wellbeing across a wide range of population groups, we have sought to understand *how* this occurs through the wild spaces/ later life/nature-adventure activity nexus.

While definitions of wilderness and wild spaces vary, and notwithstanding debate about the extent of true wilderness left in the world, our study drew out some core features of wild spaces that held meaning for our participants. While remoteness, the lack of human habitation (and indeed human presence), distance from modern technologies accord with existing definitions of wilderness (Carter and Fritz, 1995); the importance of the physical and sensory within the natural environment, alongside attributes of beauty, quiet and peacefulness were also key. Critically, whilst activities that brought a sense of thrill, excitement and challenge were important, it was being able to undertake these activities in wild spaces that was key to participants' wellbeing experiences. Managed urban or indoor spaces were not seen to convey the same wellbeing benefits; and physical activity was necessary – passive activities in wild spaces did not confer the same synergy. The context of wild spaces and their attributes thus underpinned how our participants made choices about their preferred level of engagement or absorption with their nature adventure activities. Whilst our findings reinforce Pitt's (2014) view of the importance attending to bodily motion to understand its therapeutic relationship with place, we do not elevate the position of the moving body within this nexus, rather our findings indicate that place itself is at least as, if not more, critical to understanding what underpins the therapeutic impact of the nature-adventure encounter.

In Figure 3 we attempt to map out an explanatory model of some of those mechanisms that: i) influenced our participants' engagement with nature-adventure activity; and ii) reveal how this impacts their wellbeing and the importance of the place relationship within these encounters. The points on the dials are indicative only and do not represent actual analysis of where any

specific participant sits in relation to their preferred levels of engagement /absorption or sensory stimuli.

INSERT FIGURE 1 ABOUT HERE

Routes into nature-adventure activity are important for understanding not only what motivates people's engagement with wild spaces in the first place, but also what drives and sustains their active engagement with these landscapes over the lifecourse. Most (though not all) of our participants had been initiated into some form of engagement with nature-adventure activity in their childhood or teenage years – either through family, friends or community groups. Conversely, as Helen's vignette reveals, children who are not exposed to nature in their early years may find themselves intimidated by wild spaces, suggesting a need to provide more opportunities for young people from urban areas to be exposed to natural landscapes if they are to benefit from their wellbeing potential over the lifecourse (see also Milligan and Bingley, 2007).

However, it is important to recognise individual differences in how people engage with nature activity and as our explanatory model illustrates, how these manifest through the different types and levels of engagement. Our data demonstrate that the mechanisms differ with the form of engagement. These mechanisms arise from: 1) specific combinations of person-place activity; 2) a range of mediating factors including beliefs and attitudes to ageing, preferred level of engagement and absorption with the activity; 3) the level of focus required of a specific activity

and how this impacts wellbeing; and 4) The synergy between the activity and environment – here nature-adventure activity is important as passive activities do not involve this synergy.

So, in seeking to answer the 'how question, we suggest that wilderness offers an immediate context that introduces challenges and novel stimuli to the individual and so necessitates an immediate shift in perspective. This seems to happen via one of two routes:

Firstly, through an increased awareness of sensory stimuli that facilitates open awareness of present moment experiences. Participants describe the ways in which the features of wild spaces - being in beauty, hearing birdsong etc. engages their attention, and shifts their perspective, giving them respite from the stresses and anxieties that can plague their everyday work and family lives. This can act to enhance wellbeing in itself – but also appeared to allow participants to continue to problem-solve with a new sense of perspective, and greater detachment, which is likely to facilitate broader and more flexible thinking. This resulted in 'knotty' problems being resolved that would not have happened if, for example, they had continued to sit at the desk in the same context. This route requires active engagement with wild spaces but of a less focussed kind involving less risky activities such as distance cycling etc. that allow room for more 'headspace'. This route has parallels with the idea of "effortless mindfulness in nature" as suggested by Lymeus et al (2018).

Secondly, our findings suggest an alternative route – a shift in directed attention to manage the demands of immediate risk and challenge – for example rock climbing or mountain biking. As one participant put it: '*if you think about work, then you fall off*!' This mechanism is more likely to be triggered by participating in higher risk activities in very unmanaged landscapes. These kinds of nature-activity engagement seem to work by demanding full attention – so ruminative cycles are disrupted. Here, problems are not being actively solved in the background – rather they are set aside in order to focus on the challenge at hand. However,

when attention is returned to everyday stresses, there is opportunity for a new perspective and / or a rested mind. The extent to which each of these is the key mechanism that is activated, is influenced by:

a) The degree of direct challenge that the individual has put themselves in; this might be a competitive challenge against others, and / or the challenge presented by the immediacy of the risks inherent in the activity;
b) The extent to which the older person has personal responsibility for managing these challenges, or whether it is a shared social responsibility with expert leaders present to support;
c) The extent to which the landscape in which the activity takes place is "managed". Less managed landscapes present more risks necessitating more focussed attention.

Whilst clearly these mechanisms may relate to people from any age group, our point is not that the underlying mechanisms are completely different in later life, rather it is how those mechanisms are influenced by the lifecourse and are likely to be activated differently and change as we age. Amongst the participants in this study, the extent to which people deliberately sought to activate these two different mechanisms varied and was influenced by their underlying attitudes. Some participants recognised that while they could no longer compete at the same level, or manage the same physical demands due to their aging bodies, they were still able to benefit from having to focus their attention on immediate risk and challenges – at whatever level these challenges were experienced. We also saw evidence of participants' resilience and counter arguments for ageist discourse, for example through the ways in which some participants constantly sought 'challenge' and how this could translate into a quest to learn and try new things. Others however, became concerned about engaging in these

activities in later life and were more aware of the potential risks to their ageing bodies. This awareness and concern served to distract from 'in the moment' focussed attention, lessening the benefits of engaging in these more extreme activities. In these instances, where participants were no longer able to benefit from the activity requiring active focussed attention, their nature-adventure activity shifted towards less challenging environments and less risky activities (such as wild swimming, ultra-cycling etc), which provided benefits through the provision of 'headspace' as outlined in 'route one' above.

Strengths and limitations of the study

A particular strength of this study was, that unlike laboratory-based studies common within environmental psychology, this study took a qualitative approach to engage with people in later life who were actively participating in nature-adventure in wilderness settings. By unpacking some of the mechanisms through which wilderness and nature-adventure activity contribute to wellbeing in later life we were also able to begin to address the question of *how* therapeutic landscapes contribute to wellbeing. However, the data is drawn from a fairly small convenience sample of those aged over 50 years from one specific area of 'wilderness' in the UK, all of whom can be largely defined as white middle class professionals. The interpretation of our findings needs to be understood within the context of these limitations. Our model is only as a starting point – one that should be refined and revised as further research is undertaken with a more diverse sample of participants.

Concluding Comments

While there is growing evidence for the benefits of accessing green and blue spaces for physical and mental wellbeing, there is still only a limited understanding of why and how. This is crucial

because it will determine the nature of the interventions designed to maximise these benefits – whether encouraging bodily activity in wild spaces to more passive nature-based interventions. We set out in this paper to consider *how* active engagement with wilderness landscapes through nature-adventure activities impacts on wellbeing, with a particular focus on those aged over 50 years. In doing so we sought to map out a working model of the mechanisms that effect those impacts. Moving beyond the largely behavioural focus of laboratory-based studies within environmental psychology, we drew on the concept of the therapeutic landscape but in doing so we sought to address those critiques of the concept that maintained therapeutic landscapes failed to address the 'how' questions. While our work reinforced Pitt's (2014) focus of the importance of bodily action in the therapeutic encounter, we suggest that this cannot be divorced from an understanding of the role of the contextual within this relationship. That is, how those relational, embodied, social, lifecourse and/or cultural factors that are constitutive of what wilderness environments mean for those engaged in nature-adventure activity in later life and how this impacts their wellbeing. Our model illustrates, there is no one single mechanism, rather we need to think about a range of mechanisms, often operating across a series of spectra (active/passive; safety/risk; alone/socially etc) and importantly, these are connected to place – so where that activity takes place is instrumental for wellbeing. Future research should consider whether these mechanisms are relevant to those living in other 'wilderness' locations; if and why people's engagement in solitary or group activities changes over the lifecourse; the extent to which the mechanisms we have outlined in our model hold valid for younger people and those from different socio-economic, ethnic and cultural backgrounds. Finally, with an ageing population, it is important that we focus on how we can help people to live fitter and healthier lives as they age. From a public health perspective, then, we need to consider whether nature-adventure based activities can have the same positive impacts on wellbeing in later life if individuals do not come to them naturally through the

routes outlined here – in other words, we need better evidence to assess whether the social prescribing of nature-adventure based activities might work in the same way.

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Wilderness as therapeutic landscapes in later life: towards an understanding of place-based mechanisms for wellbeing through nature-adventure activity

Introduction

Globally, there has been increased recognition within public health discourses of the importance of outdoor environments for improving and maintaining health and wellbeing. This has led to increased interest in wilderness-based therapies and mental health policies that seek to endorse the inclusion of outdoor activities in mental health services and the social prescribing of nature (see Howarth et al 2020; Bragg and Leck, 2017; van den Berg, 2017). The shift toward promoting nature-based encounters is underpinned by a growing evidence base for the beneficial health and wellbeing effects of engaging with, for example, green and blue space (Bell et al, 2014; Wood et al, 2017; Volker and Kistemann, 2015); forest schools, green gyms and trim trails (Coutts, 2016; Kim and Miller, 2019); and a range of other outdoor sporting activities (Loureiro and Veloso, 2017). At the more extreme end of the spectrum we have seen a growth in the uptake of 'nature-adventure activities' – a term used to define voluntary engagement in novel, uncertain and emotionally intense recreational activity (Boyes, 2013). Nature-adventure activities range from mountaineering and rock climbing to skiing, fell and ultra-running, mountain-biking, long-distance cycling, wild swimming, wind-surfing and more. Integral to these types of engagement is that they involve challenging physical activity either in, or on, the natural environment. Related terms include 'outdoor adventure' (Hickman et al, 2015), 'alternative' sports (Humberstone, 2012), adventure tourism and extreme sports (Buckley, 2020). While these terms overlap, the specific term used varies, dependent on the discipline and target audience.

Early work around nature-adventure activities placed risk engagement as central to the experience (Ewart, 1989; Martin and Priest, 1986) with risk, danger, uncertainty and the emotional response to fear being interpreted as fun, thrill and excitement (Stranger, 1999). Cater (2006) maintained thrill and excitement were the prime motivations for such engagement. However, in recent decades, these factors are increasingly viewed as being of less importance than the benefits of wellbeing, pleasure, learning and embodied experience gained through the emotional, social and environmental engagement with nature (Buckley, 2020).

Nature-Adventure Activities in Later Life

The beneficial effects of the natural environment have been explored for a wide range of different population groups from children to adults and for specific health issues ranging from obesity to poor mental health (e.g. Kearns and Collins, 2000; Barton and Pretty, 2010; Havlick et al, 2021). There is also a small but growing literature on the relationship between older people and everyday landscapes (e.g. Milligan et al, 2004; Finlay et al, 2015; Mossabir et al, 2021). However, the health and wellbeing impacts of nature-adventure and the effects of ageing have received only limited attention (though see Gomez-Pinilla and Hillman, 2013; Lee et al, 2017, DiPietro et al, 2017; Vivar and van Praag, 2017). By providing opportunities for euphoria as well as exercise, Buckley (2020) argued that nature-adventure activities can lead to substantial improvements in resilience and in the physical, mental and social health of people in later life. He maintains that these benefits can extend even where physical and/or mental capabilities have decreased, as an outcome of a person's adjustments in their expectations. Furthermore, the euphoria gained from such activities, Buckley suggests, can temporarily override the chronic pain and psychological stress often associated with other aspects of ageing.

For others (e.g. Dionigi, 2010; Humberstone, 2011; Wheaton, 2017), participating in nature-adventure activities does not mean that older athletes ignore the onset of later life, rather, through their pursuit of nature-adventure activities, they construct a sense of self, identity and environment through embodied sentient practices, whilst at the same time, challenging notions of what it means to be old.

Despite the growing number of studies identifying the physical health and wellbeing benefits of nature exposure, most measure a limited set of parameters and through relatively brief low-level involvement. Importantly, there has been very little focus on understanding the mechanisms through which these impacts are realised. In this paper we seek to address some of these gaps. Drawing on data from a small qualitative study, we focus on *how* active engagement with wilderness through nature-adventure activities impacts the wellbeing of people aged over fifty years in the UK. Before doing so, however, we draw on previous work exploring person-place relationships and their importance in conceptualising the impact of engaging with wilderness through nature-adventure activity.

Wilderness as therapeutic landscapes

Although significant work has been undertaken across a range of disciplines, perhaps the most intensive research into the healing or restorative properties of the natural environment has been in the field of environmental psychology. These perspectives have largely been dominated by Kaplan and Kaplan's (1989) attention restoration theory (ART) and Ulrich's (1984) psychological stress reduction framework. According to ART, directed attention is the cognitive mechanism that is restored by interactions with nature. The attentional capacities of individuals are viewed as being separated into two components: involuntary attention, where

attention is captured by inherently intriguing or important stimuli; and voluntary, or directed attention, where attention is directed by cognitive control processes. According to ART, interacting with environments rich with inherently fascinating stimuli, such as natural environments, invokes involuntary attention modestly allowing directed attention mechanisms a chance to replenish (Van den Berg et al, 2003). In a similar vein, Ulrich's psycho-evolutionary model maintains that natural environments can facilitate enhanced stress recovery and attentional fatigue, with the potential to foster restoration from anxiety by virtue of their ability to trigger positive emotional responses (Ulrich, 1979; Parsons et al 1998).

In exploring the wellbeing benefits of 'natural' landscapes, environmental psychologists have largely focused on the extent to which natural environments elicit stronger restorative effects than urban or artifact-dominated environments. These studies have been largely quantitative in nature, seeking to measure mood states, blood pressure and stress hormone levels whilst presenting participants with photographs or video clips of rural and urban scenes in laboratory settings (e.g. Parsons et al, 1998; Korpela et al, 2002; Van den Berg et al., 2003). Interestingly, Stevenson et al's (2018) review of ART literature highlighted evidence of the enhanced restoration effects of exposure to *real* versus *virtual* or lab-based environments. ART, however, has been criticised for taking a relatively passive approach to person-place interaction (Pitt, 2014) – one that largely fails to consider the significance of the place/bodily activity interaction; and the significant diversity of outcomes within ART research (Ohly et al. 2016), making it difficult to draw firm conclusions across this body of work.

Whilst environmental psychology perspectives are useful in drawing attention to the nature/person/wellbeing relationship, arguably, they fail to account for the contextual (i.e. the relational, embodied, social and/or cultural) factors that are constitutive of the relationship

between the natural environment and wellbeing. This is a critique often made by the Therapeutic Landscapes literature which has an idiographic concern with 'thick description' and hence: a) is qualitative in nature; and b) focuses on the relationality between people and the physical, social and symbolic aspects of places that contribute to wellbeing (Kearns and Milligan, 2020). In recent years, therapeutic landscapes has emerged as a dominant framework within health geography and beyond, for organising ideas around people's experiences of place and how these experiences impact health and wellbeing (DeMiglio and Williams, 2008).

The therapeutic landscape literature has also engaged with ideas around remote places, wilderness and wellbeing (see Wilson, 1992; Palka 1999; Milligan and Bingley 2007). While Milligan and Bingley's (2007) exploration of the restorative potential of woodland highlighted both positive and negative impacts that warrant consideration at the individual level, Wilson's work on cultural narratives of landscape in the North American context, revealed how encounters with wilderness offered up possibilities for personal renewal. This theme was further explored by Palka (1999) in his work on national parkland in Alaska, where he considered the therapeutic properties of wilderness that had remained largely untouched by humans. While such wilderness areas are now increasingly rare, of relevance here, is the way his work engaged with the notion that these landscapes offer peaceful and harmonious settings conducive to the provision of a healing experience for those that visit them. Defining wilderness, however, is notoriously difficult, and whilst some formal definitions exist (such as the US Wilderness Act 1964), most stress the natural state of the environment together with the absence of human habitation and other human influences (Carver and Fritz, 1995). Because the idea of wilderness is largely one of personal experience and perception, they maintain, identifying the point at which wilderness begins, in absolute terms, is subjective. Hence, to understand *how* the therapeutic relationship between wilderness and wellbeing unfolds, it is

important to understand what wilderness means to the individual engaged in that relationship. A small, but relevant, body of work, within the therapeutic landscapes literature is linked to the role of specific activities within wild spaces. Foley's (2015) work on wild swimming and therapeutic blue spaces, for example, while not specifically focused on those in their later lives, does highlight the importance of the embodied experience, where participants describe not just the visual aspects of the landscape but also their emotional response to it, the physical experience of the activity both in and on the landscape (including fatigue, sore and aching muscles etc) and the body's kinaesthetic response. Pitt's (2014) work, though focused on community gardens rather than wild spaces, makes an important contribution to the field here in that it points to the importance of bodily motion in the therapeutic landscape encounter. Pitt argues that with few exceptions, the moving body has been neglected in both this and the ART literature, and that *what* people do is as significant as where these activities take place. The activity, she maintains, is therapeutic not through a person's passive presence in place but through moving in ways that are conducive to intensely focused moments of absorption in particular skilled rhythmic activities.

In conceptualising mechanisms within the context of wilderness, wellbeing and nature adventure sport in later life, we draw on the work of Astbury and Leeuw (2010) and Vassilev et al, (2014) to take a 'realist' informed approach, defining them as those underlying entities, processes and structures which operate in particular contexts to generate wellbeing. They are shaped by the environments in which they take place, which can be enabling or disabling depending on the capacities they offer for supporting relational actions or activities beneficial to people's health and wellbeing. In adopting this approach, we seek to offer a conceptualisation of the mechanisms that underpin or explain the therapeutic potential of wilderness experiences, whilst also eliciting the relational context between wilderness / wellbeing (something that is often overlooked by ART approaches).

Aims and objectives

Despite the emerging literature on later life, nature-adventure and wellbeing, there are only a handful of qualitative studies that focus on the topic and many unanswered questions remain. For example, we know little about what kinds of engagement works for whom, how these impacts are realised and how people in their later lives define wilderness in relation to their wellbeing. Critically, the *how* question remains unanswered. Our aim was thus to begin to map out some of those underlying place-based mechanisms that contribute to wellbeing through nature-adventure activity. We do so though analysis of a small investigative study with the objective of understanding: i) how people in their later lives (for the purposes of this study referred to as those aged over fifty years) define and understand wilderness; ii) their experiences of nature-adventure in wilderness settings; and iii) the impact of these experiences on their wellbeing.

Method

The study involved twelve participants aged fifty years and over who chose to spend their free time engaging in wilderness-based nature-adventure activities in the UK. All participants were recruited from the north west of England, an area close to the Lake District National Park whose proximity to mountains, lakes, the sea and remote areas is ideal for engaging in nature-adventure activities. As we were specifically interested in those people who were already engaged in these activities, we approached organised activity groups within the area to identify potential participants who regularly engaged in nature-adventure activities. Additional participants were then recruited through snowballing techniques. Those expressing interest

were sent an information sheet explaining the study and what participation would involve. As an exploratory study, the sample size was determined by both theoretical sufficiency (Vasilieu et al, 2018) and the pragmatics of available resources. While initially a series of focus groups had been planned, the introduction of Covid-19 restrictions in the UK in March 2020 (just before we were due to begin data collection) meant face-to-face and group data collection was not possible. To enable our research to continue within the new socially-distanced environment, we adapted our approach to that of semi-structured interviews undertaken through video-conferencing. Participants were sent the topic guide in advance of the interview (see appendix 1), with interviews lasting between 40-60 minutes. Interviews were undertaken by three members of the research team members (authors 1,2 and 4) with author 2 undertaking the bulk of the interviews. All three interviewers used the same topic guide (see Appendix 1). Following written informed consent, all interviews were recorded and transcribed in full. The data were analysed using Braun and Clark's (2012) thematic analysis supported by Atlas/ti qualitative software. As part of this process, all four team members read and open coded a number of interviews each. The open codes generated from this process were then reflected on, discussed and refined in online team meetings until agreement was achieved regarding the emergent major themes.

Participants were offered a range of video-conferencing options and were able to select the platform with which they felt most comfortable. They were also offered the option of a telephone interview although none chose this option. None of our participants experienced any difficulties in adapting to the online interview approach, which may well reflect the largely middle-class backgrounds they came from (see Table 1).

The research received ethical approval from [redacted] on 23/01/2020.

Our convenience sample were all over fifty years of age (see Table 1). While we did not set out to specifically recruit from this age group, it became clear that this was an interesting group to explore as our sample were drawn from those who were biologically fit enough to physically engage with the outdoors, whilst chronologically old enough to be at increased risk of physical and mental health problems. However, acknowledging the challenge of referring to our sample as older people, we chose to refer to them as those who are in their later lives.

As illustrated in Table 1, participants ranged in age from early-50s to mid-70s with an average age of 61 years and included seven women and five men. Pre-retirement, most participants had held skilled or management-type occupations, suggesting a good level of education in their earlier lives. Most engaged in more than one nature-adventure activity with cycling/mountain biking, climbing, skiing and ultra-running being the most common forms of activities.

INSERT TABLE 1 ABOUT HERE

Reflecting on the influences of the research team, authors 1 and 3 come from health geography backgrounds and along with author 2, have an interest in therapeutic landscapes and furthering our understanding of the relational mechanisms between people, place and wellbeing. As such, all three researchers were primed to draw out the importance of context. Author 4 is a clinical psychologist whose work focused on mental health and training in mindfulness. As such, her interest was on drawing out beliefs about ageing and the impact of nature-based activities on

present moment awareness. Authors 1 and 2 also have a background in ageing and wellbeing and as such were sensitive to changes over the life span.

Findings

Defining Wilderness

Whilst acknowledging that there was no 'real' wilderness left in the UK - perhaps with the exception of a few remote parts of the Scottish Highlands - participants identified a set of characteristics that were important to them as they sought out places in which to engage in their nature-adventure activities. Key physical features of wilderness activity spaces included unmanaged or less manicured landscapes (often mountainous) or sea/waterscapes where there was no, or limited, evidence of human impact and technology such as a phone signal. Such environments were described as 'back country', remote and devoid of people. Key to our participants' sense of wilderness, was that it required them to be away from civilisation, a long way from help and modern conveniences. These characteristics echoed those earlier definitions of wilderness identified by Carter and Fritz (1995). However, being remote and devoid of civilisation was not sufficient. Characteristics of quietness, beauty, and being a habitat for wildlife were also important, as were participants' affective responses to wilderness. In particular, participants referred to wilderness as having the ability to engender feelings of wonder, alone-ness, excitement, fear and terror.

> *Wilderness for me is something inside that I feel when I'm out on the hills. Yeh, so it's nothing to do with if you like, the environment; it's about how I feel yeh. .. For*

me, the top of a mountain, dark at night with a little head torch where I'm terrified, that would be Wilderness. [Carol, 70]

Routes into nature-adventure activity

Critical to understanding the mechanisms that facilitate people's wellbeing through nature-adventure activity in later life is an understanding of how engagement with nature-based activity in wilderness settings is initially stimulated and how it is sustained over time. Our data suggest a number of different routes into nature-adventure activity that can largely be grouped into four categories:

i) Formative childhood or youth experiences: often stimulated though activities undertaken with, or encouraged by, parents, or community groups such as the scout or guiding movements, school, college or university activity groups;

ii) Work or volunteer activity in young adulthood: e.g. joining the armed forces or other active employment, undertaking self-development activities such as Outward Bound courses or enrolling in the Duke of Edinburgh's scheme (https://www.dofe.org/) etc;

iii) Friends or relations: being encouraged to participate by a partners, friends or neighbours who already engaged in nature-adventure activity and provided the 'support' to stimulate that initial engagement;

iv) 'Critical moments' in the lifecourse: events that stimulated a change in lifestyle, for example, moving to an area that made wilderness engagement more accessible, or

significant life-changes resulting in a re-thinking of priorities and how that person's life would be organised such as retirement, bereavement or a health scare/awakening.

..we would go for walks in the Peak District with mum and dad so that was not real Wilderness but still little 'mini Wilderness' for little people. So that was from the age of 5 or 6. [Fiona, 52]

Most of these 'routes in' to nature-adventure activity are based on wider contextual factors that can be seen to have stimulated participants' long-term socialisation into the activities and into promoting an appreciation of the wilderness landscapes in which the activities are conducted.

I suppose I was fairly sedentary and bit of a geek at school, but I got into the Duke of Edinburgh. So just the walking through the wilderness was really great for me. At the end of school I had an expedition trip with my Duke of Edinburgh friend in Sky and got myself into problems on, what are pretty tricky mountains for this country …so when I went to university I said, well let's learn a bit about climbing. So I joined the climbing club … and I suppose I defined myself as much by adventure and climbing and my activities, from that point. [Jim, 58]

However, as the fourth category suggests, one mechanism that can trigger people's engagement with nature-adventure activity in wilderness landscapes is linked to more personal lifecourse or behavioural events.

I didn't start [ultra] *running until I was 60, when I retired, and I had never done anything like that before. … But the way it made me feel to start with, once I achieved something and I thought ooh I'm part of this group and I'm really enjoying this, it just makes you feel so good about yourself.* [Carol, 70]

Carol's decision to take up ultra-running was linked to having more time in retirement, a partner already engaged in various forms of nature-adventure activity, and the desire to combine her love of wild spaces with an activity that brought her a sense of achievement and a sense of being part of a social network of like-minded people.

Ageing and nature-adventure activity

Whilst an understanding of what stimulated initial engagement with nature-adventure activity is important, it is also vital to understand why older people continue to engage with (or even newly take-up) nature-adventure activity, as well as how this engagement can change, with increasing age. Buckley (2020) pointed to the importance of a sense of euphoria for sustaining engagement with nature-adventure in wilderness in later life, and the data from our participants certainly reflected this, but our study also suggested that nature-activity activities need to be linked to adventure, risk and fun (Cater, 2006).

A lot of it was the Wilderness aspect, to actually be out on the lake with the most fantastic views at the level of the lake itself. Just have this sort of wonderful feeling of being in the middle of nature. [Lesley, mid-60s]

If I'm honest, I think I like risk. If it was risk free; if it wasn't some element of danger I wouldn't be so interested. Not that I've got a death wish or anything like

that; so the natural world here is the true meaning of adventure. I like to do things where you don't really know what's going to happen. Yeh, so wilderness is adventure for me. [George, 52]

Our participants' excitement and pleasure engendered through risk and uncertainty and the embodied experience gained through the socio-emotional and environmental engagement with nature reflects the known experiences of younger adults (Cater, 2006; Buckley, 2020). However, our participants also recognised the limitations that their ageing bodies placed on their engagement with nature-adventure activity.

So I do go climbing but I will do the easier stuff now because I haven't got the strength to do the harder stuff. Plus I've lost my head for confidence at height again…I find it physically harder now I'm older; I have to face it. [Katherine mid 50s]

This did not represent a withdrawal from nature-adventure activity in favour of gentler forms of sport and exercise; rather it led participants to look for ways in which to overcome age-related limitations. In particular, they referred to relying more on technique than strength; recognising the challenges of the ageing body but looking for solutions to enable them to continue participating in their preferred nature-adventure activities and sharing those solutions with others.

I think when you're experienced, it's all to do with, I would like to say wisdom …of having experienced various situations that you know, that you need to have preparation for, or you need to be more cautious… the body isn't designed to go at

the rate it did all those years ago and so it's planning in advance for what you can still do, while still pushing it as far as you can, I think. [Elizabeth, 62]

For some, adaptation involved taking up new nature-adventure activities that still presented the mental and physical challenges important to their engagement with wilderness, but which better accommodated the limitations of their ageing bodies:

Isla [55] *Now I've got quite a lot of arthritis I do quite a lot of open water swimming, which is quite new for me. If 10 years ago someone said I was going to be throwing myself in cold water, I would have laughed in their faces then. I find it similar to being out on a hill without hurting so much anymore* (laughs)!

Int: *So it's similar?*

Isla: *Yes it is. Something about the challenge, I don't know... there's the feeling, the being out there. I found open water quite scary and I wasn't a great swimmer, I had to learn to swim properly.*

The importance of such activities for both enhancing and enabling a person's sense of self in later life, as well as their emotional and social wellbeing, led our participants to look for less challenging ways of engaging in nature-adventure activities. In some instances, it was about accepting that while it was still possible to participate, the taking part and completion of the activity was now more important than the competitive element. As Carol [70] put it, '*My goal is to finish the events; so to complete them rather than compete. I can't compete with the youngsters but I can finish them'.*

Hence people's preferences for nature-adventure activities can change over the lifecourse. Buckley refers to this as 'leisure lifepsychle' (2017, p.95) that reflects the psychological trajectory of ageing, highlighting two major thresholds in people's nature-adventure activity in later life linked to self-esteem. Firstly, when that person realises that younger friends and colleagues are now more skilled than they at the activity, so they are no longer 'leaders'; and secondly, when they realise they are no longer able to keep pace and have become a burden to the group, but are respected for their past achievements rather than their current capabilities. In these circumstances the person needs to reassess their achievements to avoid loss of self-esteem.

Wilderness as a therapeutic space

While the importance of exercise for maintaining health and wellbeing, and the role of green and blue space as settings for that exercise is well acknowledged, what is less clear, is how wild spaces, as sites of nature-adventure activity, facilitate wellbeing. It could be argued, for example, that seen purely as a form of exercise many nature-adventure activities could equally well be undertaken in urban settings, indoor fitness centres, running tracks, swimming pools and so on. Indoor climbing walls and artificial ski slopes may even be argued to offer safer and alternative spaces for individuals to continue engaging in their chosen nature-adventure activity as they age. What our data illustrate however, is that wild places hold specific sensory and visual attributes that are key to how an individual successfully engages with their chosen nature-adventure activity and these underpin the mechanisms that facilitate wellbeing. For Isla, for example, it is the physical and emotional relationality in which the ***combination*** of the wilderness landscape and nature-adventure activity contribute to a sense of self, exhilaration and personal achievement that is important and could not be gained from an urban setting:

I think I like it when there is a bit of a challenge; just going and sitting in a beautiful [urban] *park wouldn't give me the same thing, even if there was nobody around. It's something about having made some effort to get there. ..... I definitely feel that the getting out, the feeling of achieving something, managing your own fears, your physical failings but succeeding, yeh ... and in the wilderness so much is down to you. There aren't people around, there's nothing going to kind of suddenly step up and go hey! you know, let me take your hand, this is all over. It is down to you; you have to make those decisions.*

For Jim, it was the active engagement with nature and wilderness rather than a passive 'managed' engagement that was key:

...it could be around a very strong wind; it could be around a very powerful waterfall; you are seeing elemental forces and by seeing them, being close to them more powerfully, I think it's deeply impacting and engaging with it rather than standing with a crowd at the other side of the bannisters in front of Niagara Falls, is very, very different, a very different experience.

This combination of the nature-adventure activity experience and the characteristics of wild spaces were viewed as important contributors to how participants' wellbeing was positively impacted. As Helen commented:

Maybe it helps you sort of reset a bit I don't know really. ...The more I think about it the more I think it is a combination of things that makes me feel that it's a positive thing for my wellbeing. It's the sense of challenge; it's the adrenalin rush if you like of doing something quite energetic ...it's that buzz and it's the fact that you are in

a sort of wild place with little sign of other humans, if you know what I mean, not a crowded place. For me I think it is that combination of things really.

Other participants highlighted the importance of the challenge that the landscape itself presents, requiring them to focus their attention and view the landscape differently in order to successfully complete their activities, whilst at the same time absorbing the sensory aspects of wilderness.

Nature-adventure, ageing and wellbeing

Our data suggest that the mechanisms that facilitate wellbeing in participants appear to differ dependent on the form of nature-activity engagement with wilderness. For some activities, such as rock-climbing, mountain biking and windsurfing, the challenge and level of skill required to complete the activity successfully requires a 'clearing of the mind' in order to enable them to concentrate and focus fully on the task at hand. This absorption with a particular nature-adventure activity leaves no room to focus on other issues that may be negatively impacting an individual's wellbeing. To illustrate how the wellbeing impacts of people's engagement with wilderness through nature-adventure activity in later life varies, and the mechanisms that can contribute to these relational effects, we draw on two vignettes. These vignettes were selected as they provided interesting but differing insights but overall were illustrative of the broader findings emerging from the study.

Figure 1 *Vignette: Andrew (68)*

Andrew is a former architect who moved to the Lake District 30 years ago as he found his previous place of residence (a smallish city) had become too 'urban'. His nature-adventure activities include mountain-biking, cycling, mountaineering, skiing and windsurfing. Though he hasn't windsurfed for many years, he views it as his 'first love' but changed to mountain biking some years ago when he became

fed-up having to continually wait for 'the right' conditions to windsurf. Mountain biking, he feels can be done anytime, with wet conditions only enhancing 'the challenge'.

Andrew loves the 'challenge' and adrenaline rush he gets from nature-adventure activities. He believes that specific types of nature-adventure activities, such as mountain biking, windsurfing and mountaineering are good for his mental health, especially when he is experiencing a period of anxiety and depression. He maintains they require both mental and physical engagement in ways that leave no room for him to focus on his anxiety and depression. He compared this to walking and road biking which, while having their own wellbeing benefits, did not require the same combination of mental concentration and physical engagement. Rather, he felt that these types of activities allowed him the 'mental head-space' to work through 'knotty issues' that he was unable to resolve 'in the office'.

Andrew maintains that he would not have gained the same benefits from exercising in an indoor space such as a gym, where the body becomes physically exhausted, but there is no mental stimulation. Sitting, painting or doing less physical activities in wilderness would also not have the same impact because the dual challenge to his physical and mental capacities would not be fully engaged in the same way.

Andrew's vignette (Figure 1) illustrates how nature-adventure activities have a positive impact on his wellbeing but importantly, different activities are seen to do so through different mechanisms. On the one hand his vignette refers to nature-activities *in and on* wilderness and which require skill and intense concentration (such as mountaineering and windsurfing). Such

nature-adventure experiences act positively through 'filling the mind', allowing no room for him to focus on his anxiety and/or depression. The extent to which this has a long-lasting effect is unknown and would need further exploration. On the other hand, nature activities such as walking or road-cycling *through* wilderness allow for a strenuous physical 'work out' of the body whilst freeing up the mind to work through 'knotty problems' that he has been unable to resolve at home or in the workplace. Importantly wilderness, as a natural place, and the activities themselves were seen to be mechanisms that were critical to how Andrew's physical and mental wellbeing were positively impacted; and active over passive engagement was key. Here there was a clear physical and emotional relationality between the individual, his nature-adventure activities and wilderness.

Our second vignette (Figure 2) highlights the importance of the social aspects of some nature-adventure activities, but also how the impact of ageing can impact this experience – in both positive and negative ways - and how the person adjusts to these new circumstances as they age.

Figure 2: *Vignette: Helen (64)*

Helen is a retired teacher, brought up in the northwest of England, but who moved to a city as a young adult. She moved to the Lake District a number of years ago. Helen's primary nature-adventure activity is mountain and long-distance road cycling but she also skis, canoes and has in the past been a runner, windsurfer and hillwalker. Her route into nature-adventure activity was through her parents, who were keen fell-walkers, and took her mountain walking on holidays as a child. She reflects on the importance of being introduced to wild spaces in childhood and how,

as a teacher, she saw children born and living in cities being intimidated by wilderness.

Helen refers to herself as an anxious person who worries what might happen in wild spaces if she or her partner fell or had an accident. Hence, for her, nature-adventure is a social activity, something to be undertaken as part of a group or led by someone expert in the activity. She also notes some of the negative experiences of wilderness activity she has had when, as part of a group, she has fallen behind and as a result felt as if she has held the group up. At the same time, however, she sees this as part of challenging herself through the activity, acknowledging it is not all 'plain sailing'.

Helen reflects on the importance of the 'buzz', sense of achievement and challenge she gets from nature-adventure activity but notes that she does not enjoy all such activities. For her, it is important to feel secure and 'inside her comfort zone'. While the physical activity of cycling through wilderness clears her mind and helps her 'sort things out', the sensory is also key to her nature adventure activity. She refers to the importance of the 'sense of peace' she gains from a favourite vista on her cycling route, and how she brings this to her mindfulness meditation when at home.

Helen reflects on the difference between nature-adventure activity in wild spaces and the less challenging 'walking for wellbeing' groups who undertake short walks much closer to human habitation; walking or cycling in city parks where traffic noise and large numbers of people inhibit the sense of peace and the other sensory elements which are integral to her nature-adventure experience; and more

sedentary activities such as painting and meditation in wild spaces. For her, the combination of place, openness, quiet and the challenge of nature-adventure activity are crucial to her well-being experiences.

Helen's vignette illustrates not only the importance of providing routes into wilderness engagement early in life, but also how it is the *combination* of wild spaces and her nature-adventure activities that is important for her wellbeing. Like Andrew, the sense of achievement, 'buzz' and challenge are key, but crucially for her, a sense of security and not feeling out of her depth is also important for alleviating her anxiety. Being part of a group, even where this can result in negative (if temporary) experiences, is also important for her sense of security. Finally, Helen's vignette highlights not just the importance of the relationality between the landscape (and the characteristics of that landscape) and the activity for wellbeing, but also how the sensory elements of the landscape are 'stored' to be drawn on in mindfulness meditation in other places.

Discussion

We set out in this paper to address two interlinked issues: firstly, to unpack and model some of the mechanisms that underpin how people's engagement with nature-adventure activity in wild spaces impacts their wellbeing in later life; and secondly, how, through identifying these mechanisms, we can begin to respond to critiques of the Therapeutic Landscapes literature that, with few exceptions, fail to engage with the 'how' questions. Moving beyond the now significant body of literature that demonstrates the impact that both unique and everyday spaces

can have on health and wellbeing across a wide range of population groups, we have sought to understand *how* this occurs through the wild spaces/ later life/nature-adventure activity nexus.

While definitions of wilderness and wild spaces vary, and notwithstanding debate about the extent of true wilderness left in the world, our study drew out some core features of wild spaces that held meaning for our participants. While remoteness, the lack of human habitation (and indeed human presence), distance from modern technologies accord with existing definitions of wilderness (Carter and Fritz, 1995); the importance of the physical and sensory within the natural environment, alongside attributes of beauty, quiet and peacefulness were also key. Critically, whilst activities that brought a sense of thrill, excitement and challenge were important, it was being able to undertake these activities in wild spaces that was key to participants' wellbeing experiences. Managed urban or indoor spaces were not seen to convey the same wellbeing benefits; and physical activity was necessary – passive activities in wild spaces did not confer the same synergy. The context of wild spaces and their attributes thus underpinned how our participants made choices about their preferred level of engagement or absorption with their nature adventure activities. Whilst our findings reinforce Pitt's (2014) view of the importance attending to bodily motion to understand its therapeutic relationship with place, we do not elevate the position of the moving body within this nexus, rather our findings indicate that place itself is at least as, if not more, critical to understanding what underpins the therapeutic impact of the nature-adventure encounter.

In Figure 3 we attempt to map out an explanatory model of some of those mechanisms that: i) influenced our participants' engagement with nature-adventure activity; and ii) reveal how this impacts their wellbeing and the importance of the place relationship within these encounters. The points on the dials are indicative only and do not represent actual analysis of where any

specific participant sits in relation to their preferred levels of engagement /absorption or sensory stimuli.

INSERT FIGURE 1 ABOUT HERE

Routes into nature-adventure activity are important for understanding not only what motivates people's engagement with wild spaces in the first place, but also what drives and sustains their active engagement with these landscapes over the lifecourse. Most (though not all) of our participants had been initiated into some form of engagement with nature-adventure activity in their childhood or teenage years – either through family, friends or community groups. Conversely, as Helen's vignette reveals, children who are not exposed to nature in their early years may find themselves intimidated by wild spaces, suggesting a need to provide more opportunities for young people from urban areas to be exposed to natural landscapes if they are to benefit from their wellbeing potential over the lifecourse (see also Milligan and Bingley, 2007).

However, it is important to recognise individual differences in how people engage with nature activity and as our explanatory model illustrates, how these manifest through the different types and levels of engagement. Our data demonstrate that the mechanisms differ with the form of engagement. These mechanisms arise from: 1) specific combinations of person-place activity; 2) a range of mediating factors including beliefs and attitudes to ageing, preferred level of engagement and absorption with the activity; 3) the level of focus required of a specific activity

and how this impacts wellbeing; and 4) The synergy between the activity and environment – here nature-adventure activity is important as passive activities do not involve this synergy.

So, in seeking to answer the 'how question, we suggest that wilderness offers an immediate context that introduces challenges and novel stimuli to the individual and so necessitates an immediate shift in perspective. This seems to happen via one of two routes:

Firstly, through an increased awareness of sensory stimuli that facilitates open awareness of present moment experiences. Participants describe the ways in which the features of wild spaces - being in beauty, hearing birdsong etc. engages their attention, and shifts their perspective, giving them respite from the stresses and anxieties that can plague their everyday work and family lives. This can act to enhance wellbeing in itself – but also appeared to allow participants to continue to problem-solve with a new sense of perspective, and greater detachment, which is likely to facilitate broader and more flexible thinking. This resulted in 'knotty' problems being resolved that would not have happened if, for example, they had continued to sit at the desk in the same context. This route requires active engagement with wild spaces but of a less focussed kind involving less risky activities such as distance cycling etc. that allow room for more 'headspace'. This route has parallels with the idea of "effortless mindfulness in nature" as suggested by Lymeus et al (2018).

Secondly, our findings suggest an alternative route – a shift in directed attention to manage the demands of immediate risk and challenge – for example rock climbing or mountain biking. As one participant put it: '*if you think about work, then you fall off*!' This mechanism is more likely to be triggered by participating in higher risk activities in very unmanaged landscapes. These kinds of nature-activity engagement seem to work by demanding full attention – so ruminative cycles are disrupted. Here, problems are not being actively solved in the background – rather they are set aside in order to focus on the challenge at hand. However,

when attention is returned to everyday stresses, there is opportunity for a new perspective and / or a rested mind. The extent to which each of these is the key mechanism that is activated, is influenced by:

a) The degree of direct challenge that the individual has put themselves in; this might be a competitive challenge against others, and / or the challenge presented by the immediacy of the risks inherent in the activity;
b) The extent to which the older person has personal responsibility for managing these challenges, or whether it is a shared social responsibility with expert leaders present to support;
c) The extent to which the landscape in which the activity takes place is "managed". Less managed landscapes present more risks necessitating more focussed attention.

Whilst clearly these mechanisms may relate to people from any age group, our point is not that the underlying mechanisms are completely different in later life, rather it is how those mechanisms are influenced by the lifecourse and are likely to be activated differently and change as we age. Amongst the participants in this study, the extent to which people deliberately sought to activate these two different mechanisms varied and was influenced by their underlying attitudes. Some participants recognised that while they could no longer compete at the same level, or manage the same physical demands due to their aging bodies, they were still able to benefit from having to focus their attention on immediate risk and challenges – at whatever level these challenges were experienced. We also saw evidence of participants' resilience and counter arguments for ageist discourse, for example through the ways in which some participants constantly sought 'challenge' and how this could translate into a quest to learn and try new things. Others however, became concerned about engaging in these

activities in later life and were more aware of the potential risks to their ageing bodies. This awareness and concern served to distract from 'in the moment' focussed attention, lessening the benefits of engaging in these more extreme activities. In these instances, where participants were no longer able to benefit from the activity requiring active focussed attention, their nature-adventure activity shifted towards less challenging environments and less risky activities (such as wild swimming, ultra-cycling etc), which provided benefits through the provision of 'headspace' as outlined in 'route one' above.

Strengths and limitations of the study

A particular strength of this study was, that unlike laboratory-based studies common within environmental psychology, this study took a qualitative approach to engage with people in later life who were actively participating in nature-adventure in wilderness settings. By unpacking some of the mechanisms through which wilderness and nature-adventure activity contribute to wellbeing in later life we were also able to begin to address the question of *how* therapeutic landscapes contribute to wellbeing. However, the data is drawn from a fairly small convenience sample of those aged over 50 years from one specific area of 'wilderness' in the UK, all of whom can be largely defined as white middle class professionals. The interpretation of our findings needs to be understood within the context of these limitations. Our model is only as a starting point – one that should be refined and revised as further research is undertaken with a more diverse sample of participants.

Concluding Comments

While there is growing evidence for the benefits of accessing green and blue spaces for physical and mental wellbeing, there is still only a limited understanding of why and how. This is crucial

because it will determine the nature of the interventions designed to maximise these benefits – whether encouraging bodily activity in wild spaces to more passive nature-based interventions. We set out in this paper to consider *how* active engagement with wilderness landscapes through nature-adventure activities impacts on wellbeing, with a particular focus on those aged over 50 years. In doing so we sought to map out a working model of the mechanisms that effect those impacts. Moving beyond the largely behavioural focus of laboratory-based studies within environmental psychology, we drew on the concept of the therapeutic landscape but in doing so we sought to address those critiques of the concept that maintained therapeutic landscapes failed to address the 'how' questions. While our work reinforced Pitt's (2014) focus of the importance of bodily action in the therapeutic encounter, we suggest that this cannot be divorced from an understanding of the role of the contextual within this relationship. That is, how those relational, embodied, social, lifecourse and/or cultural factors that are constitutive of what wilderness environments mean for those engaged in nature-adventure activity in later life and how this impacts their wellbeing. Our model illustrates, there is no one single mechanism, rather we need to think about a range of mechanisms, often operating across a series of spectra (active/passive; safety/risk; alone/socially etc) and importantly, these are connected to place – so where that activity takes place is instrumental for wellbeing. Future research should consider whether these mechanisms are relevant to those living in other 'wilderness' locations; if and why people's engagement in solitary or group activities changes over the lifecourse; the extent to which the mechanisms we have outlined in our model hold valid for younger people and those from different socio-economic, ethnic and cultural backgrounds. Finally, with an ageing population, it is important that we focus on how we can help people to live fitter and healthier lives as they age. From a public health perspective, then, we need to consider whether nature-adventure based activities can have the same positive impacts on wellbeing in later life if individuals do not come to them naturally through the

routes outlined here – in other words, we need better evidence to assess whether the social prescribing of nature-adventure based activities might work in the same way.

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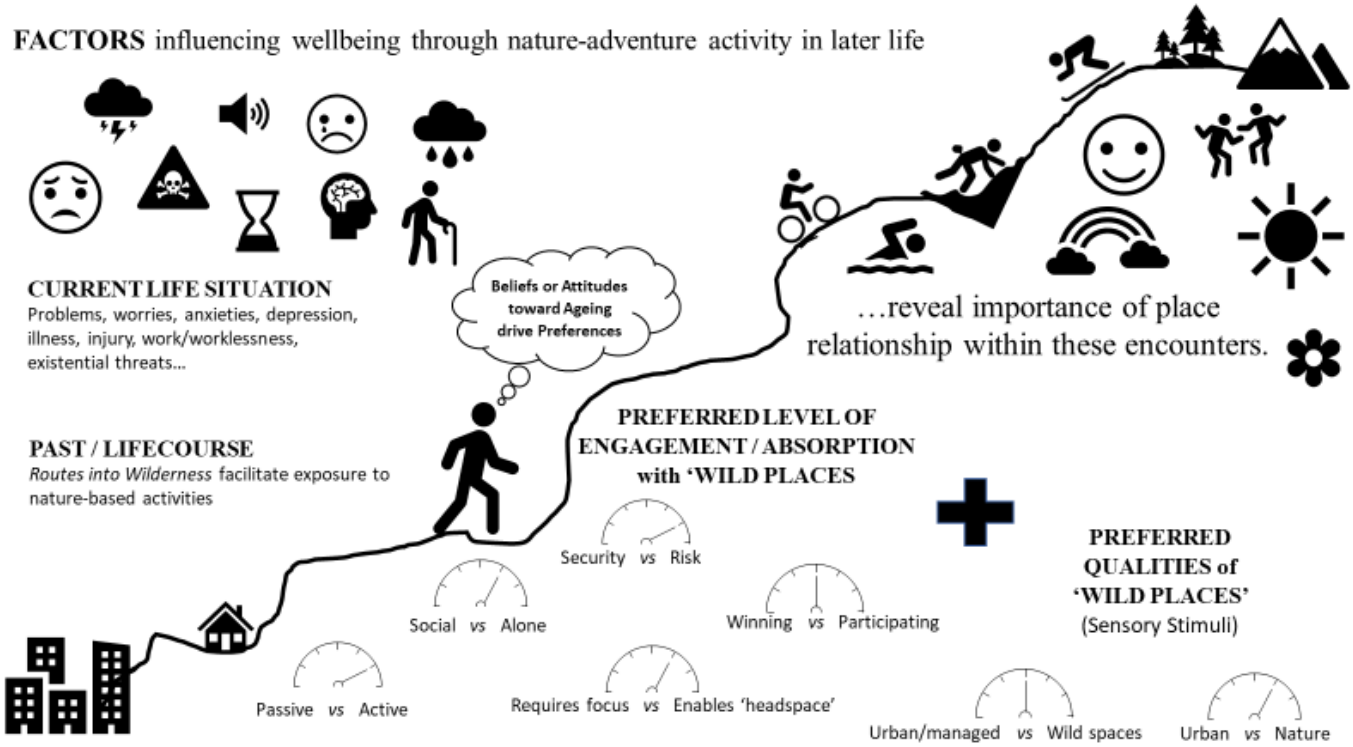
Table 1: Participant data by age, previous occupation and nature-adventure activities undertaken

Pseudonym	Self-reported age	Occupation/previous	Nature Activities
Andrew	68	Retired Architect	Cycling, mountain biking, wind-surfing, skiing, walking
Brian	68	Retired Outdoor activities instructor	Climbing, ultra-running, ultra-long-distance cycling
Carol	75	Retired Barrister	Ultra-running
Dave	56	Armed forces	Rock climbing, ski touring, ski mountaineering, fell running
Elizabeth	62	Community nurse	Fell running, cycling, walking
Fiona	52	Self-employed	Climbing, mountain biking, hiking and trekking, alpine skiing, ski touring.
George	52	Self-employed	Rock and ice climbing, mountain biking, alpine skiing, ski touring
Helen	64	Retired teacher	Road cycling, mountain biking, skiing, hill walking
Isla	55	Leisure manager	Climbing (rock, alpine, winter), mountain biking, open water swimming, paddling
Jim	58	Teacher	Rock climbing, mountaineering, skiing
Katherine	Mid 50s	Senior marketing manager for outdoor equipment company	Rock climbing, skiing, mountain biking, walking, paddle-boarding
Lesley	Mid 60s	Retired IT project manager for large bank	Open water swimming, distance walking, rock climbing, cycling

Figure 1


FACTORS influencing wellbeing through nature-adventure activity in later life
CURRENT LIFE SITUATION
Problems, worries, anxieties, depression, illness, injury, work/worklessness, existential threats…
Beliefs or Attitudes toward Ageing drive Preferences
…reveal importance of place relationship within these encounters.
PAST / LIFECOURSE
Routes into Wilderness facilitate exposure to nature-based activities
PREFERRED LEVEL OF ENGAGEMENT / ABSORPTION with 'WILD PLACES
Security vs Risk
Social vs Alone
Winning vs Participating
PREFERRED QUALITIES of 'WILD PLACES'
(Sensory Stimuli)
Passive vs Active
Requires focus vs Enables 'headspace'
Urban/managed vs Wild spaces
Urban vs Nature

Christine Milligan was the principal investigator on the project, undertook some data collection and analysis and was the lead author on the paper. Christine wrote the main body of the text and undertook the revisions.

Gareth Chalfont was the researcher employed to work on the project, undertaking most of the interviews and analysis and helping with the construction of model. Garuth read and commented on various drafts of the paper.

Alex Kaley was a co-investigator on the project and undertook some data collection and analysis. Alex wrote some of the draft introductory material for the paper and read and commented on various drafts of the paper.

Fiona Lobban was a co-investigator on the project and contributed to the analysis and development of the model. Fiona also read and commented on various drafts of the paper.