

**‘It helps make the fuzzy go away’: Autistic adults’ perspectives on nature’s relationship
with wellbeing through the life course**

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Abstract

Background. While previous work highlights links between nature and various positive wellbeing-related outcomes, the experiences of autistic people in nature have received limited empirical research. Our study aimed to gather autistic adults’ perspectives on the relationship between nature and wellbeing in both childhood and adulthood.

Methods. We used an online survey to capture the views of 127 autistic adults across the UK. Using reflexive thematic analysis, we analysed responses to three questions focused on nature experiences in childhood and adulthood and how the participants felt that nature was (or was not) related to wellbeing. Guided by self-determination theory, we used both inductive and deductive analysis.

Results. We developed three main themes to reflect the nature experiences of autistic adults: *choosing to escape into nature, supporting relatedness through connecting in (and to) nature, and nature doesn’t judge, but other people do.* Compared with many other contexts, nature provides a non-judgmental space through which (in both childhood and adulthood) many, but not all, autistic individuals can meet individual needs and experience autonomy, relatedness, and competence.

Conclusion. This analysis of how autistic adults in the UK utilise nature to support wellbeing has implications for how nature can be used in social prescribing as well as in ensuring that existing outdoor spaces, organisations, and activities are supportive of autistic people.

Community brief

Why is this an important issue? Autistic adults often experience poorer mental health and overall wellbeing than neurotypical adults. Since some autistic adults are very interested in nature and often report that they feel better after spending time in nature, natural spaces and activities taking place outside could be one way of improving wellbeing for autistic adults.

What was the purpose of this study? There is very little research on how autistic adults experience nature, although some autistic people have written about their experiences. The purpose of this study was to develop an understanding of how autistic people experience nature and how nature might benefit their wellbeing.

What did the researchers do? We created a survey that asked 26 questions about how autistic adults experience nature. This survey included questions about how often they visited nature, if they had a focused interest in nature, whether and how nature was related to their wellbeing, and childhood experiences of nature. Focusing on three of the questions, we used reflexive thematic analysis (a way of identifying patterns in data) to develop three themes.

What were the results of the study? The three themes we developed were: *choosing to escape into nature, supporting relatedness through connecting in (and to) nature, and nature doesn't judge, but other people do*. These themes illustrate the different ways that autistic adults experienced nature. For some, nature was a way of relating to others and relating more deeply with themselves. Nature was also a way of escaping from people who were unkind, from situations that were uncomfortable, and from other stresses in life. Many autistic participants reported that nature was helpful to their wellbeing because they experienced less judgment from natural spaces and creatures – though other people were sometimes judgmental, which made nature experiences worse.

What do these findings add to what was already known? These findings confirm previous research showing that many autistic people have focused interests in nature. The findings add to the numerous existing anecdotal accounts about how autistic people feel in nature but also

demonstrate a diverse range of perspectives. Not all autistic participants in this study felt that nature was beneficial to their wellbeing.

What are the potential weaknesses of the study? Unfortunately, surveys are only accessible to people who have Wi-Fi/internet access, can use a computer or phone, and have the time to complete the survey. The survey might also have drawn in participants who were specifically interested in this topic, which might influence the findings.

How will these findings help autistic adults now or in the future? These findings will help autistic adults, practitioners, and carers to identify a potential source of support for wellbeing. As autistic adults in this study used nature to meet different needs related to their wellbeing, natural space and nature-based activities may help improve wellbeing in autistic adults who enjoy nature.

Keywords: nature, wellbeing, mental health, autism, self-determination theory, autistic adults, autistic childhood experiences

Introduction

Across widely ranging contexts and developmental stages, nature has been linked to improved wellbeing. In childhood, time in and near nature is associated with improved mental health outcomes,^{1,2} improved self-esteem,³ and increased social interaction.⁴ At school, nature-based learning is widely viewed as an effective way of promoting autonomy in children.⁵ In adulthood, spending time in nature is associated with reductions in physiological markers of stress,⁶ improved subjective wellbeing,^{7,8} feelings of connection even in the absence of social connection,⁹ and benefits to cognition.¹⁰ Increasing the accessibility of nature, non-traditional means of engaging with nature, including through technology, has also been linked to similar benefits.^{11,12}

Autism is a neurodevelopmental condition that is described in the DSM-5 as being characterised by ‘persistent deficits’ in social communication and interaction as well as ‘restricted, repetitive’ behaviours.¹³ However, researchers and autistic advocates alike have called for a reframing of the diagnostic criteria for autism to instead include a focus on how society disables autistic people because of their differences in social communication and behaviour.¹⁴ In their influential work on challenging the ableist language that permeates research and practice with autistic people, Bottema-Beutel and colleagues¹⁴ suggest that research and practice should focus on embracing autistic identities in the pursuit of promoting improved wellbeing rather than trying to encourage autistic people to adopt neurotypical behaviours and ‘social skills’; the current study is guided by such suggestions. However, it is important to note that such an approach, which is informed by the neurodiversity paradigm, does not suggest that autistic people are never disabled by their being autistic; similarly, this approach considers that autistic people have valid support needs that will not be addressed solely by adjusting the environment.¹⁵

Low wellbeing is an urgent concern amongst autistic people and practitioners, carers, and researchers in the larger autism community.^{16,17,18,19} Mental and physical health are both indicators of wellbeing that appear diminished in autistic people,^{20,21,22} who also experience difficulties in accessing physical and mental health support as practitioners often lack knowledge of autism.^{23,24} Masking, or acting in a way to pass as neurotypical based on societal norms for social interactions, is a prevalent practice amongst autistic people, particularly women²⁵; Cassidy et al.²⁶ reported that approximately 90% of their respondents masked in social situations. It is associated with increased anxiety and depression.^{27,28} Given the detrimental impact of masking on mental health, there is a need for social (and non-social) environments that are accepting and supportive of autistic people as they are, without the pressure of neurotypical expectations. The elevated mental health difficulties experienced by autistic people highlights the need to identify and develop low-cost supports to promote wellbeing. Social prescribing (including time in nature) is one promising means of accomplishing this.²⁹

There are many anecdotal reports from autistic people who feel that natural spaces support wellbeing and are aligned with their focused interests and passions.^{30,31} Although Pellicano et al.³² have proposed that Nussbaum's³³ capabilities approach may be a useful framework for understanding why nature might be relevant to autistic people's quality of life, existing studies of their experiences in nature have thus far been largely limited to evaluations of how school-based outdoor programmes, including Forest Schools, impact autistic children.^{34,35,36} These studies show academic, social, and wellbeing benefits for autistic children, suggesting that nature-based learning should be considered more often to improve autistic children's school experiences.

Much less is known about how autistic adults relate to and experience nature. Many autistic people report finding joy in specific, focused interests that include nature-related

topics, such as gardening and birdwatching.^{37,38} Additionally, many autistic people have specific sensory needs and find it difficult to contend with human-made sensory stimuli.^{39,40} As humans have evolved to process natural stimuli, many people find it less effortful to process nature-based stimuli.⁴¹ Thus, nature could be a setting that provides both opportunities to embrace focused interests and a respite from the painful sensory stimuli associated with built, non-natural environments.

Self-determination theory^{42,43} (SDT) is a multi-part theory of intrinsic motivation and psychological wellbeing. It includes a Basic Psychological Needs mini-theory, which posits that human flourishing hinges on meeting three universal needs: autonomy, relatedness, and competence. That is, motivation and wellbeing are fostered when individuals feel able to act of their own volition, feel that they have the skills necessary to thrive in their environment, and feel that they belong. This mini-theory has been used both to understand how and why people engage with nature⁴⁴ and to frame explorations of autistic people's lived experiences (e.g., at work⁴⁵). Friedman et al.³⁶ applied this lens to explore and document how Forest School, a type of nature-based learning, supports wellbeing in autistic children.

Framed by the Basic Psychological Needs mini-theory of SDT and developed alongside autistic people, in this study we sought to understand how, throughout the life course, nature may support wellbeing in autistic people. We focused on responses to three survey questions to explore autistic adults' views on: (i) childhood nature experiences; (ii) how to improve nature experiences for autistic children; and (iii) whether / how experiences in nature across the lifespan are related to sensory needs, mental wellbeing, and focused interests.

Methods

Ethics

This study received ethical approval from the University of Cambridge Department of Psychology's research ethics committee (reference number PRE.2021.073). The survey was pre-registered on the Open Science Framework repository (<https://doi.org/10.17605/OSF.IO/7X9JD>)⁴⁶ and was distributed via Qualtrics. Participants completed a consent form at the start of the survey, and responses were stored anonymously (see Appendix 1 for a full copy of the survey, including information sheet).

Sampling and recruitment

Participants were recruited through Twitter (convenience sampling⁴⁷) and the newsletters of two autism organisations (purposive sampling⁴⁸). We contacted colleagues from Northern Ireland, Wales, and Scotland to assist in recruiting from those areas to counter the high number of respondents from England. The survey was opened on 28 October 2021 and closed on 25 November 2021. 127 adults in the UK who identified as autistic (either professionally or self-diagnosed) took part, and survey completion times ranged from approximately seven minutes to two hours ($M = 35.1$ minutes, $SD = 48$ minutes; $n = 4$ were excluded from calculating the mean and standard deviation as the recorded time the survey was open in their browser was over 24 hours).

Survey development and community involvement

In total, three paid autistic consultants helped design and pilot the survey to ensure its accessibility and interest to autistic people. One main consultant, RN, worked with SF, the lead researcher, to develop the topics for the survey and the overall design and formatting of questions. In line with guidance from the National Institute of Health and Care Research, RN was paid £80 for the equivalent of a half day of work. In conceptualising this study, SF was guided by engagement with literature on autistic focused interests, autistic wellbeing, and the benefits of connection to nature and nature-based learning. RN drew upon lived experiences and personal interest in nature, and both RN and SF were influenced by experiences working

with autistic children in nature-based education settings (i.e., Forest School). When generating these survey questions and the larger research questions for the overall survey study, we did not consider SDT as we did not consider the potential application of this theory in this context until after the survey was created and the study was carried out. SDT was only considered in the later stages of analysis (including writing up) of this current study.

Two other autistic consultants piloted the study; one met with SF via Zoom to discuss their thoughts while the other shared their thoughts over email. As agreed, both consultants who piloted the survey were sent £10 Amazon vouchers to thank them for their time. The feedback from all three of these community members was fundamental in shaping both the content and design of the survey. For instance, after piloting the survey, one consultant noted that several questions in the survey were redundant, causing the survey to be unnecessarily lengthy. We deleted questions in line with their feedback. The other consultant who piloted the survey noted questions they felt were unclear or difficult to answer; we clarified the wording of these questions in response. One of RN's main suggestions was to include examples of the types of responses we were seeking to eliminate participants' fears of answering the questions incorrectly. While SF initially wanted to include a formal measure of sensory needs, RN suggested it would be best to allow participants to describe their own sensory needs using a text box. This feedback was critical in creating a survey that was accessible and relevant to autistic people. The involvement of these three autistic community members can be considered participatory research in the form of consultation, as conceptualised by Fletcher-Watson et al.,⁴⁹ with elements of partnership with autistic people.

Survey methods are a recommended method of qualitative data collection with autistic people,⁵⁰ and the perspectives of the autistic consultants were important in creating a positive experience for participants completing the survey. Participants who completed the survey were given the opportunity to opt into a prize draw for one of fifty £10 vouchers.

In developing the survey, we chose to use the terms ‘special interests’ and ‘hyperfixations’ as this was the language most familiar to us at that time, and this was the language used by the autistic consultants contributing to the survey. As explained in the survey, we used ‘special interests’ to refer to those interests that have lasted for multiple years and ‘hyperfixations’ to refer to interests which are shorter-term and last from a few days to one or two years. However, we have since learned that these terms are not most frequently preferred by the autistic community as they can be patronising and harmful¹⁴; therefore, throughout this paper, we will use the preferred term ‘focused interests’ in place of both ‘special interests’ and ‘hyperfixations,’ as there is no need to distinguish between the length of the interests for the purposes of this study.

Analysis and rigour

In this paper, we focus upon three of the 13 open-ended, text box questions in the survey (which also contained 13 close-ended questions). These three questions were:

- Does being in nature have an impact on your mental health?
- Please describe the experiences in nature you had during your childhood.
- Do you wish anything was different about your experiences in nature as a child? If yes, what do you wish was different?

We used Braun and Clarke’s^{51,52,53} style of reflexive thematic analysis to both inductively and deductively analyse participant responses to these questions. The first author, SF, began the analysis process inductively with a close reading of responses to each of the above questions in the dataset, taking notes as she read. Then, SF went back through the data and constructed initial codes and, following the first round of coding, went back through the dataset in the opposite direction for a second round before developing candidate themes. The third author applied her methodological expertise and distance from the research topic to serve as a qualitative data auditor. Her feedback enabled SF to adjust the analysis and begin

writing up. At this stage, the SDT framework was considered, and the analysis (which includes the process of writing up) became deductive; the final presentation of the results and discussion are framed by the three basic needs of SDT. The participant quotes have only been edited if spelling or grammar prevented them from being easily read. Identifying information has also been removed.

Braun and Clarke^{51,52,53} emphasise the need for researchers to be transparent and upfront about their positionality when employing reflexive thematic analysis and, indeed, when adhering to the qualitative paradigm more widely. SF is an autism researcher interested in the potential benefits of nature; she believes in the value of nature, evidenced by her Level 3 Forest School leader qualification and research activity on the subject. Given her outsider status, SF worked with an autistic consultant (the second author) and two other autistic people to align the research more accurately with the interests of the autistic community.

The analysis presented in the current study draws from the same participants as another study by this same group of authors,⁵⁴ which was framed by stress reduction theory⁴¹ and focused on responses relevant to the Covid-19 pandemic. Complementing this work, the current study is framed by SDT and considers responses from the same participants related to their entire life course. Friedman et al.⁵⁴ found that many autistic participants reported that nature helped support their wellbeing during the Covid-19 pandemic, by providing either space away from others or an opportunity to connect in a disconnected time. Those findings, while illuminating about the understudied relationship between autistic people and nature, are bounded by the Covid-19 context and the acute psychological distress that this time caused for many people. As such, a more expansive lens is needed to understand autistic people's views regarding their experiences in nature throughout the life course. The themes that we developed in the current study echo the Covid-specific themes in their focus on escaping and connecting but also diverge, specifically with the inclusion of the third theme in the current

study, *nature doesn't judge, but other people do*. We will now present the findings from the current study, which focuses on autistic peoples' experiences with nature across the life course.

Results

Demographic information

Table 1 presents demographic information from 127 participants ($n = 114$ completed the full survey while $n = 13$ completed only part of the survey), including participant gender, age, employment status (n.b., we did not differentiate self-employment as a distinct type of employment as we considered this to fall into the full or part-time employment categories; however, we note that a lack of clarity around this might have confused self-employed participants who did not know which category to select), location in the UK, accessibility needs, and focused interests. Participants who reported a focused interest were given an opportunity to describe the topic of their interests. In line with other estimates that suggest 75-95% of autistic people have focused interests,^{55, 56} most respondents (86.6%; $n = 110$) indicated that they had a focused interest. Of the 106 respondents who answered the question asking if their focused interests were related to nature, 62.3% ($n = 66$) reported that they were. Nature-related interests fell into two categories: (i) nature as the focused interest (e.g., communing with nature, human-nature relationships, natural systems, animals, plants, insects, and nature's influence on music); and (ii) outdoor spaces as the host of focused interests (e.g., football, exercise, driving in the countryside, walking, and photography).

Thematic analysis

The three main themes in this qualitative survey study of 127 autistic adults – *choosing to escape into nature (supporting autonomy), supporting relatedness through connecting in (and to) nature, and nature doesn't judge, but other people do (supporting competence)* – demonstrate the relationship that many participants had with nature, and the

role nature played in supporting wellbeing in line with the framework of SDT's Basic Psychological Needs mini-theory which suggests that autonomy, relatedness, and competence are universal precursors to psychological flourishing. Table 2 provides a brief description and representative quote of each theme, and Figure 1 provides a visual representation of these findings.

Theme 1: Choosing to escape into nature (supporting autonomy)

Based on participant reflections of how they experienced nature in childhood and adulthood, autistic people were able to use nature to meet a wide variety of needs, exercising autonomy. Across the life course, nature served as a place to escape a variety of demands and unwanted pressures through participants' own volition. Four subthemes illustrate how autistic participants used nature as an escape to support their wellbeing.

Subtheme 1.1: Away from family and unkind peers. Differences in social communication preferences and styles amongst autistic people often meant that social interactions, even with family and peers, could be stressful – an experience that required escape and respite. Many participants mentioned that they felt misunderstood or rejected by their families; as such, time alone pursuing their own interests was important:

'My mother would often take us to natural or historic places (her own interests), but I particularly liked the freedom of being out and about (in those different days) and away from my family, where I was a tolerated outsider.' (woman, 55-64 years old, England)

In addition to using nature as an escape from family, some autistic adults said that their childhood nature experiences were purposefully solo to avoid mixing with other children in contexts such as Guides and Scouts:

'In my childhood I spent a lot of time in nature by myself, drawing and making things with piles of wood and stones...I enjoyed being able to get away from other people

and not having to worry about what they thought... My parents tried to involve me in outdoor based groups and I tried this. I remember enjoying making fires and being outside in the woods but hated having to sleep in a tent and that other people who were not always kind were around.' (woman, 45-54 years old, England)

Subtheme 1.2: Away from social demands. Participants noted the benefit of choosing to spend time in places in which they had to endure fewer social interactions and demands in natural spaces: *'Going outside in a place with less people and cars means that I don't have to process as much social information as usual. Lets my brain buffer, if you will.'* (woman, 18-24 years old, England)

This lack of people had important implications for accessing the benefits offered by nature. Natural spaces that were noisy or crowded were not enjoyable for many autistic people and could ruin the experience of being outside, causing discomfort or distress. In this way, not all natural spaces were not equally beneficial:

'The local park is not an option. Even when I had someone to go there with it was a frightening place. Just the screeching of the kids alone is so triggering. I miss being in nature but, with no realistic way for a lone woman with no transport to enjoy it safely, I'm resigned.' (agender person, 55-64 years old, England)

Subtheme 1.3: Away from the frenzy of modern life, into perspective. Nature also offered an escape from many of the more stressful aspects of modern life; this helped to *'make the fuzzy go away'* (woman, 45-54 years old, Scotland) in some autistic adults' heads.

Practically, autistic adults perceived a benefit in going out in nature without any of the typical technology that they feel tied to in other contexts. Being outside provided the chance to switch off, both literally and figuratively:

'I am prone to anxiety and depression and find that taking my dog for a walk in nature calms my brain. Maybe it's the colour green, or the big sky? Everything seems

to be too fast for me in the 21st century; people even seem to be talking faster on the television, like everyone's in some kind of frenzy. I reluctantly have a mobile phone and like nothing better than going outside and leaving it switched off at home - freedom! The less I have to interact with people the better. I can spend ages staring at a fungus or a flower and everything else just fades away.' (non-binary person, 55-64 years old, Wales)

Many autistic adults felt overwhelmed from sensory stimuli and the many demands of operating as a neurodivergent person in a world made for neurotypical people. The opportunity to be in a space that does not require autistic people to combat this sensory assault benefitted wellbeing:

'Being in nature it feels ok to stop trying to filter everything out. I can immerse myself in the sounds/textures/smells/complex visual stimuli of a forest and it feels safe. I can't let my guard down like that in an urban environment.' (woman, 35-44 years old, Scotland)

Subtheme 1.4: Lack of access eliminates coping mechanisms. Given the importance of nature in providing opportunities to exercise autonomy and meet individual needs, a lack of access to nature had negative effects due to the removal of these opportunities, amongst other reasons: *'It's frustrating. Not even having the opportunity to go outside and enjoy nature...it's like having one less tool that will help me to relax so instead I get progressively more wound up and stressed.'* (woman, 25-34 years old, England)

For several individuals, though, the perceived benefits of nature could be experienced using other methods like books, music, and TV programmes; therefore, a lack of access may have had less of an effect on wellbeing for these people:

'To an extent I can recreate the acoustic world of nature artificially using Spotify and other services, which is my main connection to nature to meet my needs and

sometimes through reading poetry I can vicariously experience through the poet's expression. As an autistic I might not be aware if my mental health is affected unless I have an experience that meant I realised absence from nature did indeed impact my mental health in the same way that sometimes I don't realise I'm starving until I eat something. ' (man, 45-54 years old, Scotland)

Theme 2: Supporting relatedness through connecting in (and to) nature

Nature also facilitated connection and feelings of belonging – with family, peers, and the environment; this is reflected in three subthemes.

Subtheme 2.1: Time with family and peers. Many autistic adults shared that they had pleasant memories of time spent outdoors with family members during childhood, particularly on camping holidays and road trips around the UK. However, informal experiences, including hobbies like fishing and bird watching, were equally important given that they provided opportunities and shared interests through which to build relationships with relatives and peers. Some participants described having families who were fond of the outdoors and directly facilitated nature experiences through shared hobbies:

'We often spent weekends in the peaks or lakes... my mother and I would potter in the foothills and by rivers and streams where she taught me all the wild plants she knew - I still have an encyclopaedic knowledge of wild flowers and also small animals and insects which I would collect and observe closely. ' (non-binary person, 55-64 years old, England)

Subtheme 2.2: Nature as a context for social activities and interaction. Group activities in nature provided an opportunity for some participants to create social connections in adulthood based on shared interests with group members, both autistic and non-autistic, while providing respite from some typical social demands:

'Over time I observed the main activity of the mountaineering club was trad climbing so owning my own gear allowed me to go outdoors to organised meets and participate in the activities with my club on my own terms... It's also a good way of getting social contact, I find with climbing I can adjust my pace to be more or less chatty with other participants, and it is helpful always to have climbing as a topic of interest in common.' (non-binary person, 35-44 years old, England)

Subtheme 2.3: Connecting to nature. For many participants, animals featured centrally in their nature experiences both in childhood and adulthood, with most finding animals to be soothing, thrilling, and intriguing:

'I run an animal business, I am always surrounded by animals when not working, my main conversation is about animals and I cannot relate to any non-animal people. As a child I would sit alone in the woods for hours by myself just watching and listening. The only reason I would leave the house now, if I didn't need to, would be to walk in nature with my dog...nature supports this as it is full of endless creatures, animals or birds and it is ever changing and full of details to keep me focussed.' (woman, 45-54 years old, England)

As a result of spending time in nature, many autistic adults developed a strong connection to physical places. These places ranged from holiday destinations to locations they visited daily:

'I spent a lot of time outside as a child, especially with my family. We would (and still do) go for walks in the countryside, and I have a strong connection to many natural places around my home as a result.' (man, 18-24 years old, England)

Theme 3: Nature doesn't judge, but other people do (supporting competence)

Within the SDT framework, competence is defined as ‘people’s capacity to interact effectively with their environment – to understand the effects they have on the environment and the effects the environment has on them’⁵⁷ (p. 218). As such, the ability to reflect on their relationships with nature, as evidenced by responses to this survey, is one form of competence of the participants of this study. In contrast to the often-distressing social demands of other areas of life, some autistic people reported feeling more accepted when in nature. Participants reported that this, an example of feeling competent, was beneficial to their wellbeing; this is reflected in one main theme and one subtheme. That autistic participants reported feeling welcomed in nature is significant given how few spaces are truly accepting of autistic people in their authentic forms:

‘I feel at home in nature and connected...being autistic isn’t an issue when I’m in nature because I fit in just the way I am, nature doesn’t judge or try to make you change. Nature is accepting and that feels very calming and peaceful.’ (woman, 45-54 years old, England)

Sub-theme 3.1: Misunderstandings about autism decrease accessibility of nature.

Participants reflected upon many of the typical outdoor activities that children in the UK might engage in, including Scouts and Guides/Brownies, playgrounds and parks, school camping trips, and programmes like the Duke of Edinburgh’s Award. While not a universal experience, many participants reported that these activities and groups were not appropriate for them or were outright unsupportive of their needs and harmful to their wellbeing, hindering the promotion of competence as defined by SDT. Indeed, many autistic adults reported having left groups like Scouts because of traumatic experiences, including being ‘*bullied relentlessly*’ (woman, 25-34, England).

An important element of these outdoor groups is the adult leader who guides the sessions. Lack of understanding about autism amongst these group leaders seemed pervasive,

with autistic adults noting that they were excluded from participation due to certain behaviours or needs that were deemed risky or unacceptable: *'I was in the Brownies for a while but had to quit because they would not allow me to bring a small toy into the group that I used as a comfort object/stim.'* (woman, 18-24 years old, England).

Many of the adult survey respondents were not aware that they were autistic until later in life. Their individual needs, which stemmed from being autistic, were seen as them being difficult, defiant, or unnecessarily sensitive. Increased awareness and acceptance might have allowed them to spend more time in nature:

'I wish I'd have known I was autistic so that I had a reason for why certain environments made me uncomfortable. Then I might have had help to make them more accessible to me (e.g. I found beaches distressing due to the bright light and texture of sand, and knowing that I could have made sure I had sunglasses and shoes that sand couldn't get into).' (woman, 18-24 years old, England)

Discussion

An improved understanding of autistic peoples' experiences in nature

In addition to illustrating how nature supports wellbeing by promoting autonomy, relatedness, and competence, these findings contribute towards an improved understanding of autistic peoples' experiences in nature more generally, a topic previously lacking research but which could play an important role in autistic flourishing.³² As described in *lack of access eliminates coping mechanisms*, for some autistic participants, exposure to nature was not limited to traditional outdoor environments; rather, nature was also accessed through visual forms, such as TV documentaries and pictures, or audio forms, including Spotify playlists, providing these autistic adults with many options for meeting their interests in nature in the most accessible and enjoyable format for them. Indeed, according to Martin et al.'s¹² study of a general population sample, people who watch nature-focused documentaries also report

greater engagement in pro-environmental behaviours. These non-traditional forms of accessing nature should be harnessed to increase the variety of ways of engaging with nature that are accessible to autistic people.

Given the challenges that sometimes accompany having a different style of social communication, some autistic adults may use time alone in nature to address similar connectedness needs to those that social interactions also meet. Cartwright et al.⁹ reported that nature near one's home may serve as a buffer against the negative association between low social connectedness and subjective wellbeing. As such, spending time around nature may support feelings of connection and belonging. Pritchard et al.⁸ asserted that it 'seems likely that nature connection promotes a form of relatedness that is distinct from social (human) connectedness and important in its own right' (p. 1160). For autistic people who prefer not to engage with larger groups, time alone in nature could be one means of addressing a desire for connection.

These feelings of comfort and connection afforded by nature also relate to the tendency that many autistic people have to mask, or camouflage, to appear more socially neurotypical, often at the expense of their mental health.^{27,28} Both *nature doesn't judge, but other people do* and *nature as a context for social activities and interaction* demonstrate that nature may be a space in which autistic people feel able to interact with those in their environment, and the environment itself, on their own terms. For example, altered social norms in outdoor spaces or shared interests may allow for more comfortable interactions without the need to mask. With the exception of one participant who noted that being female meant they sometimes felt less safe outside, participants did not mention gender or sex in their responses. Nevertheless, gender may play a role in these experiences as autistic women tend to mask more frequently²⁵ and over 60% of respondents in the current study were

women; future research should focus on the role of gender in autistic peoples' experiences in nature.

Though the underpinning mechanism is yet unknown, study participants expressed that they experienced connection more easily in natural spaces. As evidenced by the extensive literature on the many ways that nature supports wellbeing, the potential to experience benefits from nature is vast. Elucidating the specific benefits that autistic people perceive can guide best practices in addressing wellbeing concerns, such as social prescribing for autistic adults.²⁹

Strengths and limitations

This survey study, which captured the views of 127 autistic adults from across the UK on their experiences with nature across the life course, has both strengths and limitations. The geographic spread of participants reflects that of the UK.⁵⁸ However, in several other ways, this group of autistic respondents is not representative of the autistic population in the UK. For instance, almost 40% of respondents in the current study reported being in employment, as compared with the 29% employment rate of autistic adults in the UK around the time of this study.⁵⁹ Just under 40% of respondents in the current study identified as men, which is considerably lower than the reported ratio of autistic males to females (3:1).⁶⁰ The respondents of this survey study were mostly evenly spread between 18 and 54 years old; there were considerably fewer older respondents. Regrettably, we did not ask participants to report their race/ethnicity or sociodemographic status; while the intentional exclusion of these demographic questions served to reduce the length of the survey, we acknowledge that this information would have illuminated further detail about our participants' experiences. We also acknowledge that in choosing to exclude demographic characteristics, we limit the reader's ability to contextualise the perspectives represented here. In particular, we have likely perpetuated the known over-amplification of white voices in autism research. In future,

we will follow guidelines such as those suggested by Malone et al.⁶¹ to ensure we are not excluding seldom-heard voices in this community.

Survey study research has several inherent limitations.⁶² First, the time needed to complete surveys (up to two hours in the case of the current study) can contribute to low uptake and high dropout. Second, online surveys are only available to individuals who have access to the internet. Third, participants who opt to spend time completing a survey are likely to find the subject matter interesting or relevant. That said, while the largely positive feelings towards nature that were shared by participants in this study align with this likelihood, not all participants felt that nature benefited their wellbeing, illustrating a range of perspectives. A final strength of this study was the involvement of autistic consultants and piloting partners, who shaped both the content and presentation of the survey. This increased both the interest and accessibility of the survey for autistic participants.

Implications and future research

This research is amongst the first to contribute to an understanding of how autistic people experience nature across the life course and the role that this might play in supporting wellbeing. Developing this improved understanding of autistic peoples' experiences in nature is important as it aligns with community priorities to focus research on topics which directly impact daily living, including wellbeing.¹⁹ These findings also begin to consider the 'other species' domain of the capabilities approach as described by Pellicano et al.,³² which could be yet another way of conceptualising how experiences in and relationships with nature support autistic flourishing.

The findings that we developed should inform the use of nature-based programmes both in childhood and adulthood to support wellbeing by promoting autistic peoples' interests, providing opportunities to autonomously decide how to meet their own needs, and by offering spaces in which to connect. Educators may consider integrating nature-based

learning into their practice to facilitate nature experiences for autistic children at school but should do so in a neurodiversity-affirmative manner. Parents and carers of autistic people could consider time in nature, for those autistic people who enjoy it, as a way of meeting basic psychological needs. Autistic people themselves might look to nature-based activities to connect with others or engage more fully with their own interests. Policy makers should consider the suggestions from some of the participants here to make outdoor spaces more accessible. For instance, parks and public greenspaces could include more natural areas rather than developing playgrounds or built areas; interestingly, many of these suggestions echo recommendations for good playground design more generally,⁶³ indicating that these benefits could extend beyond autistic people. Finally, practitioners who lead outdoor learning groups should update their knowledge and understanding of autism and how best to support the autistic people who attend their groups.

These findings also have potential implications for social prescribing, and particularly green social prescribing, with autistic people. There is limited existing research around the efficacy of social prescribing to address mental and physical health conditions in autistic people. Further evaluation is therefore needed as many questions exist around how to best design and implement social prescribing services for autistic people.^{29,64} However, as we deepen our understanding of the relationship between nature and wellbeing in autistic people, medical professionals should consider nature-based activities that may support some autistic patients' wellbeing needs.

Future research should be developed in partnership with autistic people and the priorities that they suggest. Potential avenues for future research might include the use of nature more formally to support mental health, such as in green social prescribing. Additionally, a more detailed investigation into how autistic people use nature to support

wellbeing could be useful to better understand the mechanisms through which this might happen. Research such as this could be conducted using interview or focus group methods.

Conclusion

Both in childhood and adulthood, nature served as one way to support wellbeing in many of the autistic adults who completed our online survey. Considered through an SDT lens, nature supported a universal need for relatedness by providing opportunities for social connection and to develop a psychological feeling of oneness with nature itself. Participants in this study also expressed feelings of relatedness when speaking about specific locations to which they felt especially connected. Nature supported the universal need for autonomy by providing these autistic adults with the chance to meet a wide range of needs on their own terms, including those to escape stress by being alone and those to connect with others. Finally, nature supported a need for competence by being a space in which many autistic people felt accepted and understood, enabling them to interact with their environment and those in it in a more confident and genuine manner.

However, some autistic adults expressed negative experiences in nature both in childhood and adulthood. Some of these experiences, particularly those in childhood, were related to misunderstandings or a lack of knowledge about autism. Other negative experiences were related to sensory overload or simply not enjoying spending time outside. While nature will not be a space that is associated with benefits to wellbeing for all autistic people, these findings contribute to the burgeoning evidence base suggesting that nature should be taken seriously as an environment that promotes wellbeing in autistic people.

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Author contribution statement

Samantha Friedman: Conceptualisation, methodology, investigation, analysis, writing – original draft, writing - review & editing, funding acquisition **Roan Noble:** conceptualisation, methodology **Steph Archer:** analysis, visualisation **Jenny Louise Gibson:** conceptualisation, methodology, writing – original draft, writing – review & editing, supervision **Claire Hughes:** conceptualisation, methodology, writing – original draft, writing – review & editing, supervision

Conflict of interest statement

The authors have no conflicts of interest to declare.

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