



# The Autistic Experience of Exercising within Nature-Based Environments: An Interpretive Phenomenological Analysis

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RESEARCH

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## ABSTRACT

**Background:** The psychological impact of exercising in nature has gained considerable research attention in recent years under the heading green exercise (GE). Literature has examined specific benefits of GE, comparison between indoor and outdoor environments and has utilised different theories to understand these benefits and differences. To date no academic literature has examined the impact of GE on autistic people with a diagnoses of Aspergers Syndrome (AS) (a former term to refer to autism without an accompanying intellectual disability), and a condition characterised by hypersensitive and hyposensitive senses, intuitively it has been suggested that the natural environment might not be a compatible setting for autistic people due to its unpredictable and sensory provoking conditions.

**Method:** A group of four autistic males were interviewed using a semi structured interview schedule. Interviews were transcribed and then analysed using interpretive phenomenological analysis (IPA).

**Results/Discussion:** Three superordinate themes were identified, positive introductions to nature (this group discussed how important having a good start in this environment was to engaging in this activity), positive association with nature (the participants viewed natural environments where they exercised in a positive way), and purpose and practicalities (participants spoke of viewing GE favourably when there was a purpose to it above and beyond doing it for its own sake) with 5 associated subordinate themes. Results suggest that autistic people appear to get considerable positive psychological outcomes from engaging within GE which relate directly to some of the features of AS e.g. disruptive concerns and that a functional purpose to the GE would be helpful in terms of encouraging uptake of and adherence to GE within an autistic group.

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## INTRODUCTION

Autism Spectrum Disorder (ASD) refers to a range of neurodevelopmental disorders, including a diagnosis of Autism, Asperger's Syndrome (AS) and Pervasive Developmental disorder (PDD) (Sturmeijer and Fitzer, 2007). Thus, autism is understood as a collective term for a group of heterogeneous disorders, characterized by impairments in social interaction, verbal and non-verbal communication and repetitive and stereotyped behaviour (Van Winjngaarden-Cremers et al., 2014). Individuals are described as being on the "spectrum" to reflect the diverse nature of autism (Lai et al., 2013; Botha et al., 2022).

Moreover, the diagnostic statistical manual fourth revision (DSM-IV) included the diagnostic characteristics and criteria for autism spectrum disorders including Asperger's syndrome (without accompanying intellectual disability), pervasive developmental disorder or PDD. However, in the recent revision DSM-V, PDD has been replaced by the term Autism Spectrum Disorder (ASD) to cover all previously recognised sub diagnosis of autism including AS. Gale and Neff, (2016) suggests that this change was made in an effort to make the diagnosis of Autism more valid and reliable, since AS was not considered distinct enough from Autism to warrant a separate diagnosis. Gale and Neff, (2016) suggests that this change may have an impact on those with a diagnosis of AS who have already integrated this diagnosis into their identity and now must integrate a new diagnosis with more pervasive stigma attached to it. As a result, the current study recognises this and uses the terms autistic and AS to describe the participants, as they received a diagnosis of autism with characteristics of Asperger's syndrome.

AS has been used as a descriptor for autism (without accompanying intellectual disability) and individuals with AS often show behavioural and social difficulties associated with autism and have cognitive and language skills above the normal range (Attwood, 1997). Individuals diagnosed and described as displaying AS may experience motor clumsiness, have problems with handwriting, and be hypo-or hypersensitive to specific sensory experiences (Gillberg and Gillberg, 1989). Autism thus far, had always been viewed as an illness from the medical model, hence the idea of finding a cure has been typical within autism research (Subramanyam et al., 2019). However, with an increase in awareness and available resources, the focus has shifted to disability and inclusion. As more autistic people are expressing themselves and their needs, a neurodiversity paradigm (Kapp et al., 2013) has emerged which embraces the biological diversity within cognitive and neurological functioning (Singer, 2017). To contextualise this, one aspect of neurodiversity suggests that autism and other neurological conditions are a natural variation among humans and with neurodiverse or neurotypical being two different ways of being and existing as humans (Jaarsma and Welin, 2012).

Along with the realisation of neurodiversity. The prevalence of autism diagnosis within the USA has also increased over the last 20 years from 1 in 150 to the current rate of 1 in 59 (Baio et al., 2018). Furthermore, global prevalence is 1.04%, which is equivalent to 700,000 autistic people in the UK (MacKay et al., 2017). Increases in autism diagnoses, in part due to expanding the diagnostic criteria, have led to increased awareness and increased access to professionals who provide diagnostic services (Rice et al., 2010). This data suggests that there is clearly a need to increase research into autistic people and ensure their situation is better understood in relation to their wellbeing.

Prevalence rates of physical activity (PA) are substantially lower in the autistic population compared to other groups (Sorensen and Zarrett 2014), there has been a dearth of studies examining PA in autistic adult samples. However, several studies have noted issues that autistic children experience with partaking in PA. It has been indicated that 80% of autistic children display recurring sensory processing difficulties (Ben-Sasson et al., 2009). Thus, displaying hypo-hypersensitivity to sensory output has been distinguished as a diagnostic characteristic associated with autism (Ben-Sasson et al., 2009). Furthermore, associated social, cognitive, physical and behavioural issues (Bandini et al, 2013), underdeveloped motor skill acquisition (Staples and Reid, 2010), embarrassment (Todd, 2012) and unpredictability of social gatherings (Sowa and Meulenbroek, 2012) are all noted as barriers to involvement. Sensory processing disorder, a disorder where sensory overload causes high levels of anxiety and distress is noted as a barrier for autistic people engaging in PA (Marco et al, 2011). This might also explain the lack of involvement for the reasons previously mentioned. However, Lancioni and O'Reily, (1998) argue that PA not only improves the physical condition but may also reduce

maladaptive behavioural patterns, such as avoidance or emotion dysregulation (Tse, 2020) in autistic individuals. Subsequent literature in this area has further demonstrated this, e.g., gardening (a recognised form of nature based exercise) has been suggested as a technique to combat anxiety for autistic children and to promote sensory integration and build social skills (Etherington, 2012). Further evidence suggests that autistic children accrue emotional and social benefits from engaging with nature (O'Haire et al., 2013; Li et al., 2019). The national autistic society (NAS) suggests PA is more important for autistic people than non autistic people as PA has a positive impact on stereotypic behaviours such as aggression, self-injury and hyperactivity (NAS 2001).

Green exercise (GE) refers to any form of exercise or PA performed in nature, wherein an individual has been exposed to the natural environment (Calogiuri, Patil and Aamodt, 2016). Significant research has gone into this topic examining the impact of nature-based exercise from a number of different perspectives. The wellbeing impact of GE is well established, with studies suggesting that overall wellbeing is significantly impacted by GE (Rogerson et al 2020), research has demonstrated a positive impact on self-esteem and mood (Pretty et al., 2005) and greater alleviation of depression than other forms of exercise (Barton et al., 2012). Reviews have examined the difference between exercising indoors and outdoors and noted that there are considerable benefits to exercising outdoors (Thompson-Coon et al., 2011; Lahart et al 2019). The wellbeing impact of PA being conducted in a nature-based setting has been consistently demonstrated as being more than the sum of each part (Geddes and Passmore, 2021).

Several theories have been utilised to explain the wellbeing impact of GE, attention restoration theory (ART) suggests that nature can provide the four components (being away, fascination, extent and compatibility) that are key to soft fascination, involuntary attention that facilitates restoration (Kaplan and Kaplan 1989), psycho evolutionary theory (PET) (Ulrich et al., 1991) suggests that there is a stress reduction when surrounded by pleasant natural scenes and participants feel a sense of calm that facilitates positive emotions. Geddes and Passmore, (2021) suggest that the wellbeing effects of GE could be related to GE facilitating flourishing. They utilised a wellbeing theory, PERMA theory (Seligman, 2011) to suggest that GE may well facilitate positive emotions, immersive activities, enable positive relationships to form, establish meaning and allow participants to experience a sense of accomplishment.

To some extent the challenges experienced by autistic people are compensated by these theoretical explanations. Soft fascination mentioned within ART if experienced could be argued to help with behavioural issues, sensory overload and aggression. The idea that within PERMA theory engagement, meaning and strong relationships are facilitated through GE would also be extremely useful to autistic population groups if GE is found to facilitate the flourishing process. Bamberg, Hitchings and Latham (2018) suggest that to enrich the GE literature it is necessary to include more qualitative investigation whereby the richness and the diversity of the wellbeing impact of GE can be drawn out. Bamberg and colleagues pointed to two papers examining GE from this perspective, Glackin and Beale (2018) examined the impact of countryside cycling on middle class and middle aged males and Allen-Collinson (2018) who examined the impact of the weather on a Welsh outdoor exercise scheme. More recently research output has responded to this call with studies taking a qualitative approach to examine sea swimming (Denton and Aranda, 2019), running (Morris and Scott, 2018), immersive water-based activities (Thompson and Willkie, 2020) and trekking (Brymer et al., 2020). The qualitative investigation has looked across gender and at a range of age groups, however, other variables such as disability, and culture still require attention. The current study is about, with and for autistic people and in order to remain true to this, qualitative insight, was deemed the mode of research that would allow the autistic voice to come through in the most authentic way.

Within the UK the National Institute for Clinical Excellence (NICE) recognise the emerging literature on GE. However, within its statement on physical activity and the environment (NICE, 2018) state that there is a need to consider, making more green and blue spaces accessible to those that do not usually utilise the space, they refer specifically to a range of areas including directly to those with sensory processing disorders, a subcategory within autism. The current study takes into consideration the issues above by investigating for the first time the experience of autistic people who take part in GE. Directly gaining the autistic perspective and experience without compromising the autistic voice and identity. This is with a view towards understanding

why autistic people engage and why others with a similar diagnoses may not engage; with the hope of providing insight and a starting point towards addressing the question. How to make the countryside and nature based environments more accessible for PA to the autistic population.

## METHOD

### METHODOLOGY AND PHILOSOPHICAL UNDERPINNINGS

An inductive approach was taken in an attempt to minimise the assumptions made by the researchers and to allow the group to speak for themselves. To further address this the current study utilised an *insider* perspective with the first author being formally diagnosed as autistic with descriptions of AS and as such commanding a privileged position within the autistic community. This privileged position is suggested to provide access to more meaningful insight across the whole research process (Perry et al., 2004). As well as having relative strengths the insider approach has been criticised potentially leading to researcher bias resulting from an over familiarity with the subject area. This study took steps to mitigate this through having a non autistic person involved at all stages except during the interviews and a third author (also non autistic) to review the final themes (see Table 2 for the process of the methodology). Noted within the literature is an exclusion of autistic voices (autistic people) (Milton and Bracher, 2013), where research participants are those with experience of working alongside autistic individuals but not those actually experiencing autism (Milton, 2014). This has led to mistrust of the literature and those researching autistic individuals (Pellicano et al., 2013; Milton, 2014). This study's participants all were diagnosed with AS and refer to themselves as 'aspies'. It must be noted that this diagnosis was retired in the UK, with it appearing as a subcategory under the umbrella of ASD (APA, DSM-5, 2013). In social contexts, the term has been withdrawn due to misconceptions about functioning labels, and the historical significance of the term 'aspergers' – Whereby Hans Asperger, a paediatrician who coined the term 'autistic psychopathy' persecuted autistic children and actively assisted the eugenics and euthanasia programmes in Vienna and Nazi Germany (Baron-Cohen et al, 2018). However, the participants received their diagnosis in childhood prior to the change of diagnosis and thus refer to themselves as having AS. Some participants, mentioned prior to interviews that this was their first-time exploring their autistic identity and their special interests. Although the first author is aware of person first language and identity in autism research – this was not explored further due to the studies aims of researching the autistic perspective and experience of green exercise and not the formalities and complexities of diagnosis.

The study used Interpretative Phenomenological Analysis (IPA) (Eatough and Smith, 2017), this was deemed the most appropriate form of analysis as we were looking to examine the lived experience of a specialist group to enable cautious generalisation (Smith, et al, 2009). IPA's underpinnings of phenomenology, hermeneutics and ideography seemed ideal for this study. The double hermeneutic feature of IPA always leads to the possibility of misunderstanding, however, within the current study it was felt that the primary researchers knowledge and experience as a member of the autistic community would reduce the likelihood of misinterpretation through enabling an insider to be fully involved throughout. In addition to this the second author was familiar with the semi structured interview process and IPA with several utilising this form of analysis. The third author acted as an intelligent layperson who had a general familiarity with the research process and was able to ask basic questions that are sometimes missed when authors are fully immersed within the transcripts.

The IPA allowed the sample to speak for themselves and the autistic voice was taken into consideration throughout the research process with representation from the autistic community within the analysis. This enabled us to stay true to our aims of creating a study that was about, with and for the autistic community.

## PARTICIPANTS

Four participants met the inclusion criteria of having a formal diagnosis of autism, and reported regularly engaging in exercise within natural environments and were within the 18–25-year-old age range, within this study all participants were 21 years old, and all were male. Further

to this all participants were in the UK higher education system at the time of the interview. Pseudonyms were used throughout to ensure anonymity; further demographic details of the participants can be found in [Table 1](#).

PSEUDONYM	ADAM	JACOB	OSCAR	EDWARD
Age (Years)	21	21	21	21
Ethnicity	WB	AC	WB	BI
SC	Middle	Middle	Middle	Working
Age of diagnosis	19	7	3	5

**Table 1** Demographic characteristics of participants (N = 4).  
 SC = Social Class,<sup>1</sup> WB = White British, AC = African Caribbean, BI = British Indian.

Due to IPAs exploratory and idiographic nature Eatough and Smith (2017) suggest between 3 – 6 participants, the current study therefore kept within the philosophical underpinnings of IPA to ensure that the participant pool is homogenous and provides rich and meaningful data. The current study is consistent with a number of other studies utilising IPA, e.g. Quinn et al., (2021) N = 5; Kampman and Hefferon, (2020) N = 3. It is further argued that smaller sample sizes are essential with Smith et al., (2009) stating such sample sizes provide ‘meaningful points of similarity and differences between participants but not so many that one is in danger of being overwhelmed by the amount of data generated’ (Smith et al., 2009, p.51). Where the characteristics of autism is recognised as an extremely diverse condition it was felt that to get meaningful insight it was necessary to take a subsection of the autistic community in this case young autistic adults from a higher education systems (without accompanying intellectual disabilities) to avoid results reflecting differences within the condition. Further this allowed us to stay true to the principle of ideography discussed above.

## PROCEDURE

Ethical clearance was applied for and granted from the local ethics committee and participants were contacted using a purposive sampling technique. This study further followed the BPS code of ethics (BPS, 2018) whereby the core principles of respect, competence, responsibility and integrity were adhered to at all times. Interviews were conducted at a time convenient to both the first author and the participant, all interviews took place via a video conferencing call. Interviews lasted between 29 minutes and 45 minutes. In total within the 4 interviews there were 2 hours and 31 minutes of interviews. Every effort was made to ensure that participants felt as comfortable as possible whereby participants knew that they were talking to an interviewer who is autistic and had received similar diagnosis to the participants with characteristics of aspergers being noted. Interviews were carried out at a time and place convenient to them and the researchers did not physically enter their personal space, to avoid factors such as sensory overload and anxiety of the participant. This process was deemed especially important given the nature of autism being that these individuals can struggle with verbal communication and due to these complexities may communicate in different ways, this may partially explain why there is a very limited number of studies examining the autistic voice directly (Courchesne et al., 2022). Courchesne et al., (2022) further argues that the lack of autistic voices and inclusive methodology within the research on autistic individuals needs addressing. Hence, the importance of the first authors experience of being autistic, to centralise the autistic perspective and reduce pathological language through co-production, making the current study ‘autistic led’ (Wood and Mitzi, 2019).

Semi structured interview technique was utilised, this is the recommended method when analysing using IPA (Smith and Osbourne, 2008) with open ended questions being utilised to gain the participants detailed understanding of their experience of GE and nature based physical activity. A series of probing questions were also available to the interviewer to assist with maintaining focus within these one-off interviews. A semi structured interview schedule was used that focussed on participants thoughts, emotions, experience and engagement while participating in GE. Reflexive journaling was used throughout the research process (Shaw, 2010), which enabled the first author to reflect on the outcomes of the study in addition

1 Social Class based on the Registrar Generals Social Classification of Occupations (Szreter, 1984).

to the research process itself. Besides capturing the thought processes around developing interpretations, it recorded any biases which were later suspended with regards to the data (Lemon and Taylor, 1997). Thus, reflexive journaling was used as a tool for understanding how the characteristics of the researcher may have influenced the perception of the participants and their experiences, and provide a diary of retrospection (Ortlipp, 2008).

## DATA ANALYSIS

Interviews were recorded and then transcribed by the first author; the following stages then took place. The first and second author both read and re-read the transcripts independently, while the first author made a judgment on the most meaningful transcript and began with the support of the second author to draw suggestive themes from the text, each interview was then considered first independently and then in light of the initial analysis and refinement took place with constant reflection and discussion throughout the process to ensure that transcripts that were examined after the first transcript were given due attention and not just made to fit within the initial attempt. Multiple refinements took place over this period and themes were eventually derived. Once themes were established the third author was asked to read and re read the themes before looking at the thematic analysis to provide comment as a non-subject area specialist that had not been as close to the research as the first and second author, this process was valuable and further ensured credibility of themes that were gathered both within and between transcripts and lead to further minor refinements. Table 2 shows this process:

	FIRST AUTHOR	SECOND AUTHOR	THIRD AUTHOR
Formation of the semi structured interview schedule	√	√	
Conduct and transcribe interviews	√		
Read, then re-read the transcripts	√	√	
Decide on the most meaningful transcript	√	√	
Analyse the most meaningful transcript	√	√	
Analyse the remaining transcripts and merge themes	√	√	
Themes reviewed independently in light of the transcripts			√
Further minor refinement	√	√	√

**Table 2** Author inputs into the methodology of the study.

## RESULTS AND DISCUSSION

The final analysis identified 3 continually recurring superordinate themes; *Positive introduction to nature, positive associations and wellbeing, and purpose and practicalities*. The final 2 superordinate themes were further broken down into 5 subordinate themes.

### POSITIVE INTRODUCTIONS TO NATURE

Positive introductions to GE nature were continually mentioned within the interviews by 3 of the 4 participants and as such was deemed a standalone superordinate theme. We refer here to the importance of how an AS person begins or restarts the process of the engagement with GE. The way that the AS person is introduced was described here as being important and there was a need to have an initial experience where the AS person would finish wanting to go through the process again leaving feeling motivated and positive about the experience. Participants referred to role models having a positive impact on their engagement, having early experiences that were memorable and enjoyable. Oscar said;

“Well no.. I remember, I remember when I was really young, I can’t remember what country it was, erm, but it was definitely outside of the UK, I was, we were picking oranges off trees and I always remember that, when I think of it now, I want to go to that place, or a similar place that’s like, that’s like the first summer memory I remember”. (P3: Line 85)

Oscar refers to early memorable experiences that PA in nature afforded him, in this case picking oranges directly from a tree in a foreign land. This perhaps led to Oscar being open to engaging with nature subsequently. Adam also mentioned the importance of the introduction in a different way when stating;

*“Erm.. erm.. I think my brother was a big role model, my older brother he erm.. he enjoys running (in the natural environment) and I erm.. follow in his footsteps a bit. Well I er... followed him in tennis as something we can do together. I do some charity runs with him and it’s really, it’s made me want to do more runs because it makes me feel good.” (P2: Line 6)*

While positive introductions have not been mentioned within the literature directly, the impact of early childhood experiences have been mentioned. Calogiuri (2016) examined the importance of natural environments for PA. The study demonstrated through the use of logistic regression how within children the perceived supportiveness of natural environments predicted participation in GE of levels akin to that recommended for health benefits. Further evidence within ‘green cycling’ (Glackin and Beale, 2018) refer to participants consistently mentioning positive formative experiences when they describe the ‘simple joys’ of cycling in the countryside. They state that references to childhood cycling experiences were typical within the analysis and point to several positive experiences that this group of middle-aged cyclists had during their childhood experiences, seemingly adding weight to the idea of a positive introduction being important to GE.

MacIntyre et al., (2019) considered early childhood experiences to be important when as a part of a mixed methods study they examined the lived experience of competitive water sport athletes, the sample appeared to point to nature being a feature of their formative years. Interestingly MacIntyre et al., sample reported a general trend towards positive formative experiences while occasionally reporting negative early childhood experiences of GE, this is contrary to what was found within the current study and could perhaps be a factor that is more important to an AS group than other groups. Within the analysis of the current study ‘positive introductions to nature’ were thought appropriate as Jacob referred to his experience of a programme which starts in adolescence as the first time that they engaged with GE.

*“I mean, I remember in the past where I was doing some sort of erm.. Duke of Edinburgh thing and I did some camping”. (P4: Line 120)*

On reflection examining positive introductions as opposed to childhood experience could represent an interesting way of looking at future research as not everyone that engages within GE will have had any experience of physical activity in nature and as such will be new to the activity outside of childhood. In addition if someone has had a neutral or negative childhood experience in order to get them involved again perhaps a new positive reintroduction could be a key factor to uptake. We suggest here that the introduction to GE warrants further investigation and results from the current study suggest positive introductions appear to be a key factor with an autistic sample. It would be interesting to investigate this further both within the autistic community but also within other groups. NICE (2018) suggest that there is a need to enhance the appeal of open spaces to groups; such as those from low socio-economic backgrounds and some black and minority ethnic groups. Perhaps a positive introduction to using open spaces for GE would be a way to partially address this and as a concept is directly transferable into areas such as exercise promotion.

## **POSITIVE ASSOCIATIONS AND WELLBEING**

Positive associations and wellbeing was the second of the superordinate themes and refers to how GE was thought of in a positive way where participants would relish the opportunity to be involved as a result of the positive impact on their state of being. Participants here went in line with previous literature that has suggested that GE has a positive wellbeing effect (see Lahart et al., 2019 for a full review). This concept sits well with the idea of flourishing through impacting both the hedonic value (feeling good) and also eudemonic value (functioning well). The concept of GE being potentially related to flourishing has been recently suggested (Geddes and Passmore 2021). The current superordinate theme appears to support this. This theme was split into three subordinate themes; *catharsis in nature, personal acceptance, and undisturbed calmness.*

Participants consistently referred to a series of positive impacts of being involved within GE. Within the literature the idea of GE facilitating restoration is well established through the ART Kaplan (1989). ART suggests that under certain conditions we can replenish our capacity to attend to everyday requirements, for this to happen ART points to 4 necessary conditions; 'being away' from stressors, being 'fascinated' by the environment, the environment having 'extent' and the individual being 'compatible' with the environment. Once these conditions are met Kaplan (1989) describes a soft fascination or involuntary attention that takes place where there is a space to replenish. This idea consistently came up within the current study, Adam when asked if nature-based environments were important to physical activity he said;

*“Yeah I think it's important to do it outside as there's more, its more freedom, and space and like I think they'll find all the noises you can hear like the birds tweeting, the wind and everything it can be more pleasurable than chattering in a sports hall as it can all be a bit disruptive I think”.*

*(P6: Line 202)*

Some of the participants were less precise considering the natural environment to a means of stress relief. Edward, when asked “*why they consider nature-based activity?*” said *Erm mostly because of the uhm... physical benefits and the feeling it's a stress reliever for me*. (P10: L 322). Another theoretical explanation could also be applied here for example Ulrich and colleagues (1991) put forward the psycho evolutionary theory (PET) suggesting that when human beings are within pleasant natural environments that stress is reduced through a feeling of calmness, facilitating positive emotions and moderating negative emotions. Oscar could also be suggested to fit within this while expressing how they felt when walking in nature, “*I feel strangely, like, enlightened for some reason, yeah*”. (P3: L 68). Considering the sensory differences amongst AS/autistic people it would appear that if a stimuli such as birdsongs and natures aesthetic is perceived to be positive and restorative then the outcome reflects that of a positive sensory experience and leads to greater feelings of enjoyment and comfort.

The participants activities required a focus of the body and mind which was achieved through movement, thus allowing detachment from their current preoccupations (Phoenix and Orr, 2014). Engagement within their activity was authentic at the moment of being physically active, which provided the participants with a prelude of sensual pleasure. Here pleasure was achieved from through being immersed in nature. Freedom of leisure, physical activity and GE have all been argued to encourage an autotelic mindset, flow states and catharsis (Johnson, 2014). AS adults usually refer to a form of burnout called 'autistic burnout', it is thought to be a result of chronic stress and conflicting expectations and abilities without sufficient supports (Raymaker et al., 2020). Although, 'autistic burnout' was not directly mentioned in the current study, disruptive concerns (external distractions such as noise from manmade objects) were, and it appeared to only be removed when the participants performed physical activity in natural environments. This was reflected when Edward said:

*“When I was mowing the lawn it was in the holidays so, I was pretty stressed relieved anyway, so generally I was just thinking about how good the weather is, in terms of nature I would be like uhm... everything is fine right now, I'm not stressed out, I'm not erm.... worried about something.”* (P4: L 132)

Future research should look to build on the relationship between GE and autistic burnout, this could examine GE, its impact on enhanced self-regulation/emotional control and psychological fatigue.

## PERSONAL ACCEPTANCE

The theme personal acceptance relates to how for the participants natural landscapes formed an environment of self-discovery, where they could be authentic. A place where the participants were able to be alone but feel connected a point previously recognised within the literature within green cycling (Glackin and Beale 2018). The special meanings nature-based environments had in contrast to less rural environments was best articulated by Adam;



*“I do prefer going for a run-in nature, like I’ve done something about 80 park runs at 9am, so I’ve done quite a few of them and that’s because I just love being out in nature and being with other people and I love when people say well done to me and meeting new people cause I haven’t, I’ve found sometimes I feel a bit lonely cause when I was at school I never had that many friends I was just studying by myself. I always felt that sport (running in nature) has helped me be more confident and meet new people”. (P4: L141)*

The participants experiences mentioned above again appear to coincide with ART (Kaplan and Kaplan, 1989). Previous literature has identified the influence of soft fascination, especially those characterized through exploration and making sense of the natural environment and its influence on psychological restoration (Kaplan 1995). The current study has disclosed aspects and the magnitude of the phenomena identified in the lived experiences of its participants. In addition to ART, these findings would appear to be consistent with Psychoevolutionary theory (PET) (Ulrich, 1983; Ulrich et al., 1991) who suggests that restoration can occur when a natural scenes bring out feelings of pleasantness and calm (Hartig et al., 2011), leading to increased positive emotional states and reductions in the physiological stress response (Gavarkovs, 2016). To a greater extent, GE was a mechanism leading to connectedness and acceptance. These findings are consistent with the biophilia hypothesis (Wilson, 1984), which suggests humans feel a meaningful and instinctive connection to nature. This is further demonstrated by Oscar:

*“I feel like, I’ve not spoke to many people with autism recently but because being autistic myself, I feel like when you’re outside in nature, you feel like you’re more part of the world, you’re apart of something”. (P5: L 162)*

The Natural environment not only provides opportunity for attentional restoration, but also for self-reflection (Herzog et al., 1997) away from an individual’s daily stressors. Meaning is one of the pillars of the PERMA theory (Seligman, 2011) the idea that you are a part of the world appears to relate well with the idea of meaning, belonging to something that is bigger than the self. Natural environments may stimulate a stronger sense of self through facilitating aspects of flourishing such as meaning, AS individuals have been suggested to struggle with a sense of self (Huang et al., 2017), further investigation into the area of the impact of GE on ‘meaning’ with AS individuals could therefore be useful. The current study provides evidence for the utilization of GE as a resource for achieving self-acceptance and an enhanced understanding of the self.

## UNDISTURBED CALMNESS

Reflections on how walking in nature encouraged a relaxed psychological state were frequently mentioned amongst the participants. Drawing on comparisons between leisure versus more vigorous activity, the essence of this was perhaps best captured by Adam:

*“I’ve also walked in parks as well with my family it’s a lot more peaceful because you can take stuff in more than when you’re running it’s a bit more intense.” (P10: L345).*

It is noteworthy that Adam refers to (recreational) walking in parks with their family and the associated benefits. Previous research has suggested that feelings of restoration from natural environments may decline when walking with others, with authors suggesting that being with others negatively influences an individual’s ability to reflect (Johansson, Hartig and Statts, 2011). This is reflected within the current sample when Oscar said:

*“Uhm.. it’s in like a lake, yeah and surrounding the lake is like forests, I really like it there when I’m there and you swim, when you swim out and you can’t stand up anywhere, you keep swimming, its away from everyone else and your by yourself. I like I love that feeling when I go there I can really think about anything and contemplate yeah.” (P5: L 142)*

The variation of nature-based activity was frequently mentioned by participants. Oscar elaborates on the benefits of getting away and having an undisturbed peaceful experience and suggests nature based physical activity is a way of achieving this. The absence of other

people afforded him with an immersive experience where he was able to reflect. Oscars experience appears to give credence to the notion of ‘clearing the mind’ which is identified in ART (Kaplan and Kaplan, 1989, p. 196). It is thought that when in undemanding environments that the mind enters a state of wandering and becomes accompanied by random thoughts. However, it may be argued that although, solo experiences (being alone) result in reflection, self-examination and re-connection with the self (Naor and Mayseless, 2017) that these experiences may only occur when individuals feel safe and calm. It might be implied that due to the sensory differences amongst autistic people that the receptiveness of the environment may be different depending upon who is present at the time of activity. Being with family may have provided an environment where Adam felt secure enough to experience ‘soft fascination’ and decreased psychological fatigue. Psychoevolutionary theory (PET) (Ulrich et al., 1991) suggests that the salutogenic benefits of the aesthetic are only activated when distractions and dangers are diminished (Hartig et al., 2011; Glackin and Beale, 2018). Jacob appear to be adding to this point when he said:

*“To tell you the truth, I don’t think I felt more relaxed, I think, to tell you the truth I think I was more relaxed on the erm.. trail area because the err.. rocky area was kind of harder to climb”. (P5: L 150)*

It is clear from the participants extracts above that running or climbing did not necessarily grant psychological engagement with the environment that was valued amongst them. Adams and Jacobs experience reflects the notion from (Rogerson et al., 2016) who suggest that when an internalised exercise focus is dominant, receptiveness to the environment might be limited. Accordingly, there might be justification for future research into the intensity of exercise within natural environments which examines how the differential landscapes could be integrated into physical activity programmes and show how the environment contributes to relaxation when different forms of exercise are combined.

## PURPOSE AND PRACTICALITIES

This theme is split into two subordinate themes. Active commuting, which addresses the occurrences where the participants described, finding themselves in nature when commuting. The second competition which is concerned with how the participants viewed nature as an environment that was advantageous towards warranting a better focus of their sporting and athletic needs and goals.

### ACTIVE COMMUTING

The theme transport refers to how the participants found themselves incorporating exercise into their daily routines whilst commuting. This was perhaps best captured by Oscar when he said:

*“Okay, cause when I’m walking (when travelling somewhere), yeah because when I’m walking I take in more notice of the nature around me”. (P2: L 57)*

All participants mentioned that they found themselves engaging in PA when commuting to work or University. It is noteworthy, that walking for Oscar afforded further receptiveness to natural environments. These findings are consistent with research that has suggested that just minimal features of a natural environment impacts people without their own awareness (Lin et al., 2014). Research does suggest that heightened awareness and exposure to nature may have a stronger positive impact (Kaplan, 2001; Lin et al., 2014). While awareness of the environment was not directly mentioned all participants took some form of GE as a mode of commuting thus suggesting an unconscious benefit or a benefit that has not been articulated by this group directly, Adam said;

*“Erm, yeah there are some days, I only really run two days, but I cycle (outside) pretty much every day, I cycle to my tennis club, like I do that on Mondays, Tuesdays and Thursdays, so I cycle there”. (P5: L 169)*

Active commuting is widely recognised within the literature, defined as a mode of travel to and from work which involves PA such as; walking and cycling (Jones and Ogilvie, 2012). It also

may, include the combination of motorized modes of travel – for example; a combination of car travel with walking or train with cycling (Jones and Ogilvie, 2012). Active commuting has been recognised within the literature when compared to inactive modes of travel, to reduce levels of overweight and obesity, reduced sickness absence, cardiovascular disease, mortality and psychological wellbeing (Celis-Morales et al., 2017; Martin et al., 2014). Participants within this study appear to take part sub consciously within this practice within a nature-based environment. Intuitively it makes sense that taking part in some form of PA that could be considered GE would enable the AS person the opportunity to avoid sensory overload and therefore relieve some of the challenges associated with comorbidities of AS such as anxiety. The participants in this study live active lifestyles, wherein nature plays an important role within their habitual scheduling and was part of their daily living. It has been proposed that integrating active commuting methods such as walking and cycling into daily routines is the best way of encouraging physical activity (Petrokofsky and Davis, 2016).

Gatersleben and Uzzel (2007) argue that walking and cycling offer more opportunities to enjoy the scenery and bring out more enjoyment, the current study supports this. Further emphasising their argument, they hypothesise that slower travel modes are attractive because they elicit optimal levels of arousal. Encouraging active travel can improve health, quality of life and the environment (Woodcock et al., 2009). The benefits of walking have been noted as increases in autonomy, mastery of the environment and social interactions (Ettema and Smajic, 2014). Accordingly, policy makers aiming to improve physical inactivity, physical and mental health should aim to promote active commuting, whilst also, incorporating green spaces in the workplace and within educational institutions. Further research into active commuting within an autistic sample would be useful to gain a deeper understanding of how active commuting could be further promoted within this population. The current study suggests that active commuting was a useful way to ensure AS individuals engage within GE.

## COMPETITION

The theme competition relates to how for the participants, the countryside and public parks formed an environment for generating feelings of pride towards their accomplishments and acted as impetus that established further motivational qualities that provided participants with a sense of mastery, excitement and completion. As Adam puts it:

*“Erm. well, when I used to do runs across country at er school, I really enjoyed being part of a team and it felt really awesome when running in new (nature based) surroundings and you don’t know where your gonna head through next, it can be quite muddy and things but it’s really awesome being against other people and yourself and trying to push yourself”. (P2: L 50)*

In competitive states the nature around Adam provided soft distractions that elicited joy and inspiration. The participants frequently spoke about how green exercise afforded them opportunities for achieving sporting specific goals and formed premise for seeking new challenges with the self, the environment and others. They describe feelings of excitement whilst being competitively immersed. Adams reflections on the surroundings imply a mix of stimulated experiences and dynamic situations wherein new challenges arose but did not diminish performance or experience. This perhaps occurred as a result of joy and fulfilment from skill mastery and outdoor competition and thus granted further explorative behaviours. These findings appear to offer support for the Ecological Dynamic Approach (Brymer et al., 2020) wherein the natural environment offered affordances in the shape of behavior invitations that correlated with the participants capacities, skills and capabilities (Withagen et al., 2012). Jacob further referred to the affordances that the unpredictability of nature brings when asked if he had a preference for exercise in nature or in manmade environments he said:

*“erm.. it might... depends really, I’m more action based, so if the activity has a bunch of action in it, so maybe some sort of race, some sort of challenge that like, uhm. you know tough mudder, yeah maybe something like that.” (P7: L 240)*

Thus referring to the unique and diverse challenges afforded by organised nature-based events such as the tough mudder events. The participants within this study saw natural environments

as providing opportunities to challenge themselves both physically and emotionally whilst reactions from the environment occurred simultaneously, resulting in positive psychological outcomes. When talking about the difference between running on a track and running on nature trails Oscar said;

*“I’d always do it (running on a nature trail) as training, so there’s competition that would probably come into my head at times which would lead me to, I’d have the thought and then run a bit faster if I was thinking about that, yeah, put a little more effort in”. (P10: L 334)*

Suggesting an immersed experience where he competes against himself as opposed to being in an environment where social anxieties and sensory overload may exist. The findings in the current study would indicate that the participants were motivated by the challenge of the outdoors. This is arguably why GE behaviours and immersion in nature is a common theme across the participants experiences. Although in different settings, similar findings were presented by (Frühaufer et al., 2017) who found that the challenge of extreme sports such as freeriding for some participants presented opportunity to explore and stretch out their personal limits. Extreme sports are also recognised as offering participants the opportunity to self-determine their own levels of challenge (MacIntyre et al., 2019).

## LIMITATIONS AND FUTURE DIRECTIONS

The limitations of the current study reflects the accessibility to autistic participants. The current study did not actively seek participants validation of the thematic analysis which would have further enhanced the validity of the findings. The current study’s findings represent insight into an autistic/AS population. Other intersectional demographic factors such as age, gender, social class, ethnicity and disabilities may impact the GE experience. However, the evidence is limited to suggest that these differences in experience exist (Wood et al., 2016). Therefore, to better understand the effects of green exercise on these social identities, the barriers to accessing it and how it might be utilized requires further investigation. It would be very interesting to build on the work of (Geddes and Passmore, 2021) who examined GE in relation to flourishing, perhaps a mode of opening up this forum would be a deductive qualitative piece around one of the major theories of flourishing such as Huppert and So (2013) conceptualisation of flourishing. Future research beginning to link GE to the climate emergency including but not limited to, attitudes towards the climate emergency through aspects such as positive introductions to GE, nature connectedness and sense of place of those that indulge in GE would be another interesting development.

## CONCLUSION AND PRACTICAL IMPLICATIONS:

This study examined the impact of the lived experience of GE on autistic people. The study put considerable effort into ensuring that participants felt comfortable to discuss their experiences in a meaningful way. The three superordinate themes; *Positive introduction to nature, positive associations and wellbeing*, and *purpose and practicalities* all have practical implications. Positive introductions is to the authors knowledge the first time that this has been mentioned within the literature. It is subtly different from a recognised approach within the literature that mentions the importance of positive childhood experiences. Positive introductions is perhaps a useful way to look at GE from an applied perspective as it is controllable for those that encourage take up of this form of exercise with autistic participants that have either not been involved prior or have had previous negative experiences. This suggests considerable thought should go into ensuring that the initial experiences of GE are positive. While this research examines those from an autistic population this is worthy of consideration in other groups, e.g. this study found things specific to an autistic population from PA in nature, perhaps there might be other subtle nuanced differences within other subgroups. Positive associations and wellbeing is well recognised within the literature and the combined impact of exercise and nature appears to present a state of calmness and is cathartic to the participants within this study. Notably, here is the potential impact of ‘autistic burnout’, the impact of GE on autistic burnout is worthy of further consideration. Should GE have a positive impact on autistic burnout the applied implications of this are substantial to the end user. Finally, the study recognised

purpose and practicalities being important to this group. With autism being characterised by difficulties in doing things for their own sake, a purpose to the exercise and a practical outcome was a feature of how this group positively experienced GE and from an applied sense could act as a good hook to encourage uptake and adherence within this group to attain both the physical and psychological benefits of GE.

## COMPETING INTERESTS

The authors have no competing interests to declare.

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