University of Zurich[UZH]

Urgent Biophilia During a Global Pandemic: How COVID-19 Has Affected Adolescents' Relational Values and Interaction with Natural Areas in the Canton of Zurich.

GEO 511 Master's Thesis

Author
Thomas David Roethenbaugh
20-751-368

Supervised by
Prof. Dr. Norman Backhaus
Dr. Mollie Chapman

Faculty representative
Prof. Dr. Norman Backhaus

30.09.2023
Department of Geography, University of Zurich

Urgent Biophilia During a Global Pandemic: How COVID-19 Has Affected Adolescents' Relational Values and Interaction with Natural Areas in the Canton of Zurich.

GEO 511 Master Thesis

Supervisor and Faculty Representative:

Prof. Dr. Norman Backhaus

Author:

Thomas David Roethenbaugh

20-751-368

30 September 2023

Department of Geography, University of Zurich

Photo title page: Thomas Roethenbaugh (2022)

ABSTRACT

The concept of Urgent Biophilia describes a conscious, intensified inclination to connect with nature during or after a crisis. With the widespread disruptions caused by the COVID-19 pandemic to socio-ecological systems, there has been heightened academic interest in the supportive role local natural areas play in fostering individual and communal well-being and resilience. Adolescents, being at a pivotal developmental stage and more vulnerable to fluctuating institutional regulations, have been disproportionately affected by the stressors of the pandemic. This thesis examines the impacts of the COVID-19 pandemic on the interactions, perceptions, and relationships of adolescents in the Canton of Zurich with natural areas, exploring whether these changes can be considered manifestations of urgent biophilia. Employing qualitative methodology, this study involves in-depth interviews with 12 participants, aged 18-19, residing in Canton Zurich throughout the pandemic. The analysis suggests that the pandemic acted as a catalyst, intensifying participants' interactions and appreciation of natural areas. These areas were increasingly valued as providing escape from home confinements and serving as alternative social spaces to urban areas. Natural areas were increasingly valued as places of solitude and rejuvenation, alongside their role in facilitating profound social connections—attributed in part to reduced electronic device usage therein. A notable adaptation was the adoption of a walking routine, primarily driven by the well-being benefits of natural area immersion. Participants displayed heightened recognition of local nature as therapeutic landscapes, with shifts in relational values centring around nurture. The thesis concludes that the participants' conscious drive to interact with local natural areas indicates that Urgent Biophilia was expressed by adolescents in Canton Zurich due to the pandemic scenario.

Key Words: Urgent Biophilia, COVID-19 Pandemic, Adolescents, Natural Areas, Well-being, Qualitative Methodology, Relational Values

ACKNOWLEDGEMENTS

I would like to extend my sincere appreciation to my thesis supervisor, Norman Backhaus. His positivity, valuable advice and down-to-earth attitude have been instrumental in the coming-together of this thesis. I would also like to thank my assistant supervisor Molly Chapman for her appreciated advice.

I would like to thank all the students of Kantonsschule Zurich Nord who participated in the interview process. I am immensely grateful for your willingness to share your experiences and perspectives, and the time you set aside to contribute to this research. I would also like to extend my gratitude to my former colleagues from the English Department of KZN, whose kind assistance in coordinating with interested sixth-year students was invaluable. This research would not have been possible without their support.

FIGURES AND ABBREVIATIONS

Figures

Abbreviations

KZN – Kantonsschule Zürich Nord

PSU – Problematic Smartphone Usage

Table of Contents

1 INTRODUCTION

The COVID-19 pandemic has been regarded as the biggest upheaval to society since World War II (Gossling et al., 2020; Swinnen et al., 2020; Dietrich et al., 2020), with major disruptions to socio-ecological systems on a global level (Zambrano-Monserrate et al., 2020). The imposition of forced lockdowns, rules, and regulations disrupted the daily routines across all demographics, introducing unprecedented challenges, altering modalities of work and education, and significantly modifying social interactions and access to public spaces. Such widespread disruptions have been shown to have disproportionately impacted adolescents, who, at a pivotal stage of development, were more vulnerable to the stressors invoked by this global crisis (Loades et al., 2020; Xie et al., 2020; Brooks et al., 2020), as well as being more affected by the constant institutional changes during this period than other demographics (Venter et al., 2021). These factors led to a surge in smartphone addictions and feelings of loneliness, depression, and anxiety (Brooks et al., 2020).

In light of these emerging worrying mental health trends, the pandemic scenario saw heightened academic interest in the role of human-nature interactions, with many cities worldwide observing an increase in visits to urban green spaces, which saw particular spikes during lockdown periods (Mackinnon et al., 2022; Venter et al., 2020; Morse et al., 2020). Qualitative survey data showed the inherent drives behind the flocking to green spaces were driven by the motivations related to well-being, and values associated with nurture and recreation (Mackinnon et al., 2022; Morse et al., 2020). Contrastingly, studies conducted in densely populated metropolitan areas during the pandemic have demonstrated a correlation between inadequate access to green spaces and poorer well-being parameters, thereby underscoring the association between access to green spaces and improved well-being (Tomasso et al., 2021).

This heightened academic interest in nature's role in bolstering individuals' well-being during the pandemic led to the term Urgent Biophilia being used to describe the observed patterns of people flocking to local natural areas (Mackinnon et al., 2022). Urgent biophilia is an extension of Wilson's 1984 concept of biophilia, which highlights the "*innate human tendency to focus on and affiliate with life forms and life-like processes*" (Kellert and Wilson 1993).

Unlike biophilia, Urgent Biophilia describes this innate biophilic tendency becoming a conscious mechanism to bolster our well-being and resilience in times of upheaval and stress (Tidball, 2012). The concept of Urgent Biophilia was proposed by Tidball (2012), to explain nature's role in supporting a population's response, recovery, and resilience after natural disaster scenarios, like hurricanes and earthquakes.

The adolescent demographic is noted to exhibit the lowest levels of human-nature connectedness, which then naturally increase from a nadir at ages 15-16 into adulthood (Hughes et al., 2019). Coupled with the disproportionate impact of the pandemic on this age group, this raises the question of whether crisis scenarios can intensify the development of adolescents' relationships with nature as they mature into adulthood. Furthermore, if such intensifications have occurred, it is crucial to examine how they are reflected in shifting relational values and interactions with natural areas and whether these shifts can be considered manifestations of Urgent Biophilia. Given the established correlation between access to green spaces and enhanced well-being (Tomasso et al., 2021), a focused investigation into adolescents' relationships with natural areas is particularly relevant, especially within the context of the Canton of Zurich, a region distinguished by its abundant green spaces.

1.1 Objective and Research Question

This thesis seeks to understand the impact of the COVID-19 pandemic on the ways in which adolescents in the Canton of Zurich interact with, perceive, and relate to natural areas. Specifically, the study aims to discern whether any changes in adolescents' behaviour and relational values towards natural areas exhibit signs of "Urgent Biophilia"—a term coined by Tidball (2012) to denote an intensified inclination to connect with nature during or after a crisis. Mackinnon et al. (2022) specifically applied this concept in the context of the COVID-19 pandemic.

To encapsulate this objective, the primary research question posed by this study is:

- How has the COVID-19 pandemic influenced adolescents' relational values and interactions with natural areas, and if these changes are present, how do they manifest as indications of Urgent Biophilia?

To delve deeper into this inquiry, the following sub-questions will be considered:

- What shifts, if any, have adolescents noticed in their engagement with natural areas throughout the pandemic?
- How do adolescents characterize their relational values towards nature before and subsequent to the pandemic's onset?

By addressing these research questions, this thesis aspires to enrich the overarching comprehension of human-nature interactions within the adolescent demographic. Specifically, it highlights the potential alterations in these interactions precipitated by crisis scenarios, and probes the implications of such changes on mental well-being during times of elevated stress.

1.2 THESIS OVERVIEW

This thesis begins by delving into the theoretical context and conducting a literature review in Chapter 2. This section aims to provide the theoretical frameworks that underpin the study and offers a thorough exploration of existing literature in the field of human-nature relationships. This is followed by Chapter 3, which outlines the methodology and explores the qualitative approach utilised by this study. Chapter 4 presents the results from the twelve qualitative interviews, with the nuanced themes that emerged during data collection grouped into thematic sections. These themes are further explored in Chapter 5, where a discussion of the results is presented in light of existing literature, addressing their implications for the study's research questions. Finally, the themes explored in the discussion are succinctly summarized in Chapter 6, where the study's salient findings and their future implications are presented.

2 THEORETICAL CONTEXT AND LITERATURE REVIEW

2.1 THERAPEUTIC LANDSCAPES: THE INFLUENCE OF NATURE ON MENTAL WELL-BEING

The mental well-being benefits that can be derived through time spent in nature—a concept recognised by traditional medicine systems for thousands of years—has recently gained empirical substantiation, through a multitude of research on this primal link between humans and their natural environment (Selhub and Logan, 2012; Ulrich et al., 2012; White et al., 2019). The stress reducing effect of nature immersion is particularly pronounced, with Ulrich et al. (1995) identifying that any sort of nature exposure, even in the form of images, induces significant reductions in cortisol production and thus induces a pronounced relaxation effect. In terms of cognitive function, Kaplan (1995) documented a restorative effect of nature, suggesting it can replenish attentional resources that may be depleted by modern, fast-paced urban lifestyles. During times of heightened stress, such as that experienced during the COVID-19 pandemic, these restorative effects may be particularly crucial to maintaining and improving mental well-being (Ulrich et al., 1991).

White et al.'s population-based study in 2019 identified a dose-response relationship between time spent in nature and mental well-being benefits, implying that a 120-minute period of nature immersion could significantly enhance mental health (White et al., 2019). This finding aligns with Berman et al.'s (2012) observation of improved mood and memory performance during and after walks through natural areas. Immersing oneself in nature is therefore academically substantiated to be supportive of personal well-being, which provides a theoretical foundation that this research aims to build upon.

2.1.1 The Concept of Biophilia

The concept of biophilia was first brought into the limelight by Edward O. Wilson in his 1984 publication, Biophilia. In this book, Wilson delved into humanity's inherent love and affinity for nature, exploring the repercussions we face as we increasingly detach from it. He made the case that many of today's environmental and societal challenges stem from this disconnect with our natural environment (Wilson, 1984).

According to Wilson, biophilia is not an abstract concept but something deeply entwined with our evolutionary journey, contending that our ancestors' survival and prosperity were directly linked to their relationship with nature (Wilson, 1984). It was a symbiotic relationship; we thrived amidst nature's bounty, navigated its dangers, and adapted in response to its changes (Wilson, 1984).

While its roots lie in evolutionary psychology, the reach of biophilia is vast and interdisciplinary. It spills over into multiple fields of study, including human geography, which is a testament to its multifaceted nature. Pioneering thinkers and their seminal works have added layers of depth and complexity to this concept, painting a comprehensive picture of the human-nature bond. Stephen R. Kellert has enriched the conversation on biophilia significantly in his book, 'The Biophilia Hypothesis' (1993), in which he delves into our natural affinity toward nature, scrutinizing its implications for architecture, environmental conservation, and our collective well-being. Another notable work includes the iconic essay What is Conservation Biology? (1985) by Michael E. Soulé, whose insights underscore the strong ties between our prosperity and the vitality of the natural world, pressing the case for conservation rooted in biophilic principles.

The concept of biophilia has also found its way into urban planning, as explored by Timothy Beatley in 'Biophilic Cities: Integrating Nature into Urban Design and Planning' (2010). Beatley advocates for weaving nature into the fabric of our cities, fostering a deeper, more meaningful bond between urban inhabitants and their environment. In his book Last Child in the Woods: Saving Our Children from Nature-Deficit Disorder (2005), Richard Louv highlighted the ever-widening chasm between children and the outdoors. This stirring commentary has sparked efforts to reintegrate nature into the lives of communities, and especially in younger demographics. Louv's exploration of 'nature deficit disorder' and the resulting impact on

young people's well-being and development particularly resonates with this study's objective. By putting emphasis on nature's importance in fostering resilience, balanced growth, and well-being in this demographic, it highlights the importance of investigating the research focus of the relationship between young people and the natural environment during times of crisis (Louv 2005).

2.1.2 The Importance of Urban Green Spaces

Alongside these proven benefits of frequent visits to natural areas, long-term immersion, as experienced by those living rurally or in green urban areas, have also been associated with positive mental health outcomes (Alcock et al., 2014). Given that my research focuses on adolescents' engagement with natural environments within Zurich city and its encompassing Canton, the abundant literature on biophilic cities, especially in the context of the COVID-19 pandemic and the impact of residing in nature-rich environments, bears great relevance to this thesis. The concept of cities integrating nature and urban green spaces into their infrastructure is predicated on the notion that such measures enhance residents' quality of life, health, and well-being (Miliken et al., 2023; Kuo and Sullivan, 2001; Roe et al., 2013; Alcock et al., 2014; Gascon et al., 2015).

Alcock et al. (2014) found that moving to an urban area with higher-quality green elements was linked to long-term improvements in mental well-being, suggesting that nature exposure benefits are not only short-term but also have far-reaching health implications. Alongside the stress reduction effects of nature immersion, Alcock et al. speculate that these long-term health benefits of living in greener areas may also be linked to more opportunities for physical activity and social interactions that these areas help facilitate. Furthermore, the reduction in noise, traffic, and large crowds is likely to provide a lower stress environment with opportunities for rejuvenation and relaxation (Alcock et al., 2014).

The concept of biophilic cities was introduced by Beatley (2008), conceptualizing the idea as the integration and abundant presence of nature within urban environments, facilitating frequent interactions between residents and high-quality green areas in their everyday lives (Beatley, 2008; 2011). The study by Miliken et al. (2023) revealed that inhabitants of biophilic cities reported elevated levels of mental well-being, reduced stress, improved cognitive

function, and enhanced physical activity compared to those in less nature-imbued urban settings. The favourable cognitive and well-being outcomes associated with the inclusion of green elements in urban planning are well-established in the literature. In particular, the presence of natural daylight, greenery, and fresh air has been associated with enhanced mental well-being and overall productivity of office workers in urban environments (Leather et al., 1998).

Gascon et al.'s systematic review (2015) utilized data from several studies to assess the long-term health and mental well-being benefits of living in urban areas with significant exposure to green and blue spaces. The review concluded that such exposure led to reduced symptoms of depression and anxiety (Gascon et al., 2015). These findings underscore the therapeutic potential of biophilic cities such as Zurich.

Within the context of Zurich, Seeland et al. (2009) highlighted the critical role of urban green spaces in promoting social inclusion of adolescents from diverse cultural backgrounds within Swiss society. These spaces facilitated social interactions with Swiss youth, thus fostering social inclusion (Seeland et al., 2009). This portrays such spaces can offer a range of meanings and specific benefits to different demographics, which is of particular interest to this thesis, due to its focus on the adolescent demographic in Canton Zurich.

Such findings have implications for this thesis in the Canton of Zurich context, with both the city of Zurich and the wider canton, boasting significant natural area coverage, the details of which are discussed in **3.5** Study Area. The benefits from living in such an area are, therefore, likely to mean the facilitation of better well-being parameters in Canton Zurich, than those experienced in dense urban environments. However, how this long-term immersion impacts the adolescent demographic remains largely unexplored and underrepresented in these studies, and therefore qualitative exploration of adolescents' long-term immersion in a biophilic location, within a crisis context, would contribute to the existing literature on this relationship.

2.1.3 A Sense of Place

A sense of place is a multifaceted concept intricately intertwined with an individual's perception and emotional experience of a particular location (Scannell and Gifford, 2010). Having an emotional attachment, built up through experiences and memories surrounding a particular location, is linked with an individual's feelings of belonging, security, and identity; key foundations for positive mental well-being parameters. In the context of a crisis scenario, as seen during the COVID-19 pandemic, having a strong sense of place has been identified to significantly contribute to mitigating the impacts of stress and therefore bolstering psychological resilience at an individual and community level (Tidball and Kransky, 2013). Green spaces, in particular, the symbolism imbued in trees, are incredibly important in fostering an individual's sense of place (Scannell and Gifford, 2010). Trees are regarded as being symbols of resilience, endurance, and preservation, that stand as reminders of the past, hold personal memories, and signify spiritual values. Post the destruction of the 1989 Hurricane-Hugo, residents of Charleston, USA, reported the major feelings of loss and distress were associated with the destruction of the Urban trees, rather than their own properties, due to the sense of place that these trees provided (Hull et al. 2012). The role of natural areas in providing a sense of place, and the emotional stability that this provides, is a key concept within the field of nature's influence on mental well-being.

2.2 BIOPHILIA AND 21ST CENTURY LIFESTYLES

Gullone (2000) portrays the emergence of a 'nature deficit disorder' as an outcome of our lives being reshaped by urbanisation, digital technology, and sedentary behaviour. This new realm, divergent from our evolutionary origins, raises significant concerns for long-term human psychological well-being. Particularly in the post-World War Two era, the pace of change in our lifestyles has been unprecedented, leaving us in environments for which we lack evolutionary adaptations (Gullone, 2000; Saunders, 1999).

Gullone et al. cast doubt on the widely held assumption of the boundless human capacity to adapt to life amidst swiftly evolving technology that distances us from our evolutionary roots. Given that humans spent most of their evolutionary history as hunter-gatherers, it is

compelling to argue that the natural environment must have significantly influenced our cognitive and emotional functioning (Gullone, 2000).

Wilson (1984; 1993) argues from the standpoint that modern humans have inherited a brain that processes information from the natural environment, triggering emotional responses due to these surroundings' direct bearing on our survival. The sense of peace experienced while observing bodies of water likely derives from the abundance of resources that such environments provide (Gullone, 2000). Similarly, the joy derived from surveying a landscape from a high vantage point likely taps into our ancestral need to spot potential threats and resources (Kahn, 1997). Forest environments also influence our emotional states; densely forested areas with low visibility may incite a 'biophobic' response, triggering anxiety due to potential hidden threats. In contrast, less dense forests with high canopies, particularly in the verdant seasons of spring and summer, signal safety, resource abundance, and possible escape routes, providing a sense of comfort (Gullone, 2000). Though this analysis draws heavily on evolutionary psychology, it offers invaluable insights into human-environment interactions—a key aspect of human geography—and the underlying mechanisms of our innate attraction to certain environmental features.

2.3 Urgent Biophilia and Disaster Resilience

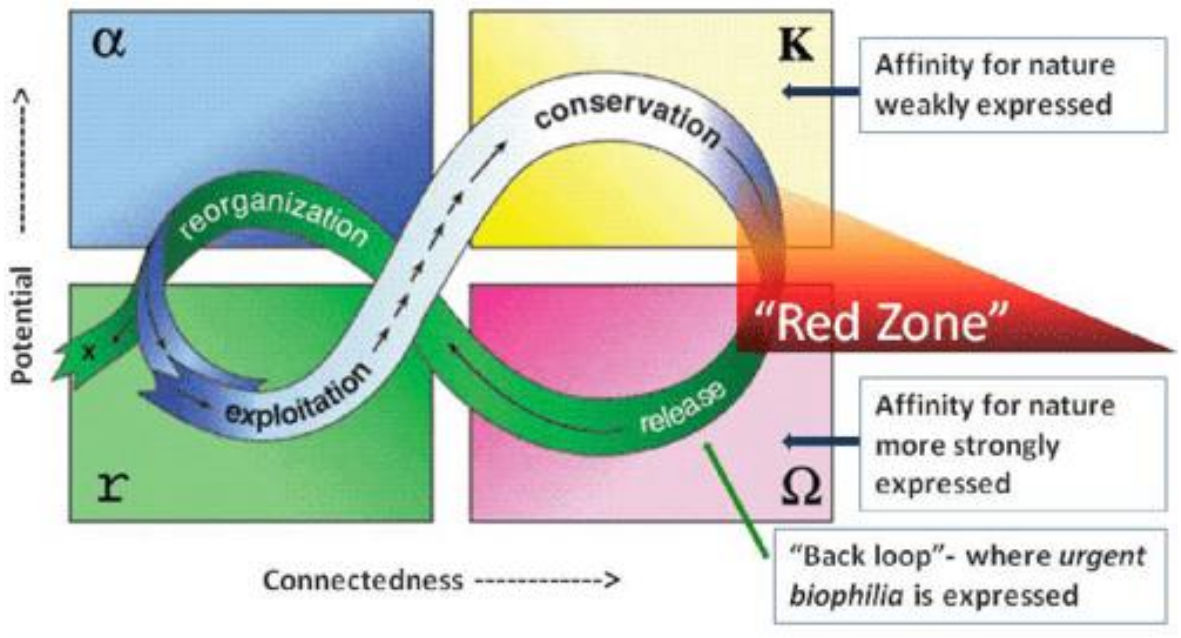

Figure 1 Human-Nature Interactions in Red Zone Recovery and Resilience (Tidball, 2012; p.2*)*

Tidball (2012) developed the term 'Urgent Biophilia' as an extension of Wilson's (1984) concept of biophilia, to describe the conscious and intentional engagement with nature as a resilience mechanism during and post-disaster. Unlike the passive affinity for nature that characterizes biophilia, urgent biophilia is proposed as an innate coping mechanism activated during times of crisis, with our affinity for nature coming to the forefront of our consciousness, causing deliberate behavioural changes to intentionally interact with nature and significantly influencing a population's response, recovery, and resilience. In Tidball's work 'Urgent Biophilia: Human-Nature Interactions and Biological Attractions in Disaster Resilience' (2012), an adaptation of the adaptive cycle model is utilized to offer a novel framework to help us understand how Urgent Biophilic behaviour manifests and plays a role in resilience during a post-crisis' scenario, like that of the COVID-19 pandemic, at a community and individual level (Tidball, 2012).

Tidball uses Holling's (1986) Adaptive Cycle model, which delineates the four stages of a Social-Ecological System (SES), to provide a more specific lens for understanding human-nature interactions within a crisis scenario. The concept of the SES refers to the complex integrated relationships where social (human) and ecological (natural) processes interact, influence one another, and co-evolve. The Adaptive Cycle begins with a growth phase followed by a conservation phase, then a release or collapse phase characterized by a crisis or disaster, and finally a reorganization phase. Tidball suggests that Urgent Biophilia is expressed in the release phase, acting as a conscious behaviour change to enhance our resilience during and post the stress and disruption the crisis imposes on the SES (Tidball, 2012).

The Red Zone, portrayed in Figure 1 diagram, represents a time of crisis, which Tidball frames as some form of natural disaster, such as an earthquake or a tsunami; however, it can also be a pandemic, like that experienced by COVID-19. The concept of the Red Zone acting as a catalyst for Urgent Biophilia in the release phase, is expanded on in 'Greening in the Red Zone' (Tidball and Kransky, 2013), underpinning this with empirical evidence from crisis scenarios, namely the 1989 Hurricane Hugo.

2.3.1 Adopting Urgent Biophilia for the COVID-19 Context

In their work, Tidball and Kransky do not specifically refer to a global pandemic as one of the possible crisis scenarios that may constitute this 'Red Zone' within the cycle, with war or natural disasters, causing physical destruction of communities being the primary focus. However, a global pandemic can create its own type of 'Red Zone' in a socio-ecological sense, presenting disruptive parameters comparable to the three main categories that Tidball describes as being characteristic of the 'Red Zone': emotional, social, and ecological. In regards to COVID-19, the fear, stress, and anxiety characteristic of emotional disruption can be directly linked to threats to personal health and the loss of normal routines, both of which are crucial for personal well-being. The social disruptions include the isolation and loneliness linked with social distancing measures and the remote schooling and working causing disruption to social and familial structures. Mackinnon et al. (2022) identified the comparability of the stress induced by COVID-19 to that of a natural disaster, thus adopting Tidball's concept of Urgent Biophilia for their Wellington, New Zealand-based study during lockdown periods (Mackinnon et al., 2022).

A further extension by Mackinnon et al. (2022) of Tidball's Urgent Biophilia concept is the range of behaviours that are accepted to suggest an Urgent Biophilic response to a crisis. The deliberate and intentional actions that Tidball and Kransky describe as demonstrating Urgent Biophilia are predominantly active restoration and cultivation-type activities following a natural disaster, including community greening projects and conservation work (Tidball & Kransky, 2013). While spending leisure time in natural areas is referenced as a sign of Urgent Biophilic behaviour, the active engagement in restoring green urban areas, like in Charleston post the 1989 Hurricane-Hugo, is predominantly discussed as the intentional behavioural response (Tidball & Kransky, 2013). However, Mackinnon et al. (2022) adapt this concept to a pandemic scenario, where green areas have not been destroyed in the 'Red Zone' disaster; therefore, active conservation and restoration activities may not be the primary expression of Urgent Biophilia. This thesis, therefore, follows Mackinnon et al.'s example by adopting the Urgent Biophilia concept for the COVID-19 context and considers time spent in natural areas for recreational purposes as the primary expression of Urgent Biophilia during and post a pandemic scenario.

2.4 Evidence of Urgent Biophilia in the Context of COVID-19

The study of Mackinnon et al. (2022) provides a compelling basis for this thesis, as the only study in the context of the COVID-19 pandemic that adopts the concept of Urgent Biophilia as its theoretical basis. Mackinnon et al. noted a marked increase in the usage of urban parks during pandemic lockdowns, a trend that peaked during periods of heightened alert. This was gauged using a mixed methods approach, consisting of pedestrian and cycle path counts, supplemented by a qualitative survey. Alongside the count data showing a marked increase of visits during lockdown periods, the survey responses underscored the intentional use of these green areas as coping strategies during the stressful lockdown periods. Based on these findings, the researchers concluded that the citizens of Wellington demonstrated evidence of Urgent Biophilia during the pandemic. This thesis aims to expand upon the findings of Mackinnon et al. (2022), through utilising a qualitative interview approach which can offer a deeper insight into participants' experiences, by providing more context and a deeper overview than survey results.

A potential limitation of this study, highlighted by Mackinnon et al. themselves, was that the majority of the survey respondents lived within a ten-minute walk from a natural area or urban park; therefore, the survey participant pool was potentially skewed towards individuals who live in close proximity to green spaces and therefore utilise this advantage (Mackinnon et al., 2022). This limitation invites investigation into whether these findings can be replicated in areas with varied access to green spaces, illuminating the potential influence of urban design on urgent biophilia expression during crises such as the COVID-19 pandemic (Mackinnon et al., 2022).

Alongside the studies of Mackinnon et al. (2022), there are a multitude of other studies that have shown a spike in urban green space visits during the COVID-19 pandemic. Venter et al. (2020) used recreational mobile tracking data from the popular fitness tracker app STRAVA, to track individuals' recreational movement across Oslo during the pandemic, identifying a 219% increase in outdoor recreational activities during lockdown periods, in comparison to the mean activity on the same days across a three-year period. These data included a two-fold increase in pedestrian and cycling activities on trails with more than 75% tree cover,

alongside a general preference for trails with greater tree cover and vegetation greenness. (Venter et al., 2020).

These findings are particularly insightful, as they imply that individuals were seeking out more green areas during their recreational sporting activities than prior to the pandemic. This could definitely be attributed to the social distancing measures, encouraging people to exercise further away from heavily used trails, which is likely to correlate with increased vegetation richness and tree canopy cover. However, when viewed in light of the Mackinnon et al. study, it is likely the well-being benefits of this shift in trail preference played a role in this deliberate behavioural change. This highlights a limiting factor in using purely count or tracking numerical data, that no context is provided to complement and explain the changes measured, highlighting the strength of Mackinnon et al.'s methodology of using a qualitative survey alongside the count data.

Another limitation of using STRAVA tracking data is the particular type of user base, namely recreational, competitive, and elite runners, cyclists and triathletes, who are likely to increase their activity during lockdown due to more time available to train, and therefore it is difficult to distinguish the biophilic motivations from those of sport performance. Venter et al. (2020) address this limitation; however, they maintain the standpoint that at least some of the recorded increases in visitations are likely a deliberate action for Strava users to reap the well-being benefits associated with nature exposure in times of COVID-19 induced stress.

Venter et al. (2021) take their analysis of STRAVA tracking data a step further in their 2021 paper, by delving into how users' movement behaviour differed across the six-month period post-lockdown measures were lifted. Venter et al. found that teenagers and young adults significantly increased their activity levels at the onset of compulsory lockdown measures. This initial spike of activity among adolescents then plateaued or decreased in accordance with schools' re-openings, in contrast to the 20-29 age group, where activity levels remained high across the six-month period post lockdown (Venter et al., 2021). This difference between adolescents and the young adult demographic is likely due to individuals over 20 not being subject to the same institutional schedule changes as those still in compulsory, full-time education.

This has interesting implications for my current research, as it initially implies a potential biophilic response to the pandemic among the young adult demographic. Therefore, the qualitative component of my research, alongside this tracking data, could offer valuable insights into this increase in green space visitations. Secondly, it shows how institutional schedule changes and particular regions' lockdown policies may have a disproportionate effect on this demographic than young adults, implying this should be considered in the context of Zurich's school and lockdown policies for this current research.

2.5 The Concept of Relational Values

Relational values denote the principles, preferences, and beliefs emerging from individuals' connections to nature (Chan et al., 2016). Similar to Wilson's biophilia hypothesis (1984), relational values also originate from the idea that humans have an inherent affinity towards our natural surroundings, a connection deeply rooted in our evolutionary past, survival, and well-being (Kellert, 1993). These values are closely associated with the relationships we form with nature.

Embracing the concept of relational values enables us to acknowledge the moral and emotional bonds humans form with their environment, emphasizing the importance of cultivating these relationships. This approach offers a unique perspective, allowing us to understand human-nature relationships by encapsulating principles and beliefs that are often intangible and difficult to quantify, unlike an area's monetary value or instrumental utility (Chan et al., 2018). Thus, relational values present a critical lens through which we can scrutinize how individuals interact with, perceive, and derive meaning from natural areas.

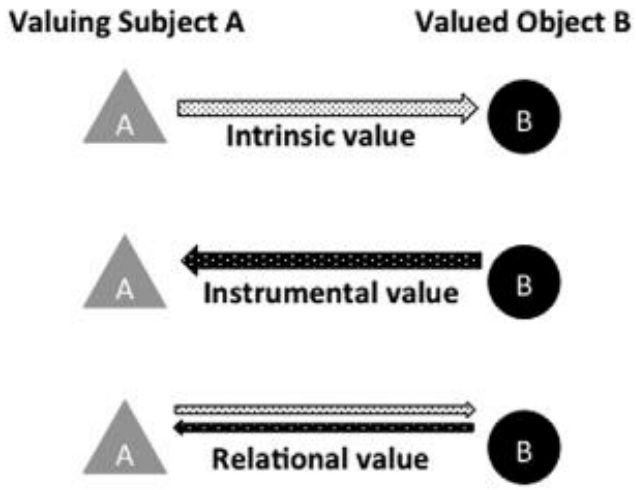

Figure 2 Directionality in Environmental Valuing (Deplazes-Zemp and Chapman 2021)

Examining the 'Directionality in Environment Valuing Graphic' (figure 2), developed by Deplazes-Zemp and Chapman (2021), aids in conceptualizing relational values as a third type of relationship an individual can have with a natural area. It also illustrates the bidirectional nature of relational values. Intrinsic values portray a relationship where the subject (A) assigns worth to the object (B) for its own sake, potentially manifesting as a monetary value (Deplazes-Zemp & Chapman, 2021).

This assignment of value could manifest as an area of forest being earmarked for property development, or a specific monetary worth assigned to a piece of land. In contrast, an instrumental relationship considers the utilitarian and physical resources that an area can provide, with the object (B) offering something to the subject (A). For example, a forest could be valued for the wood, shelter, and food it provides, disregarding its conversion into capital.

Deplazes-Zemp and Chapman integrate aspects from both these value types to articulate the bidirectional valuing relationship between the valuing subject (A) and the object (B). By interpreting relational values from an instrumental perspective, intangible aspects of nature's utilitarian value, including emotional, psychological, and spiritual facets, are acknowledged

along with the physical and functional benefits. These are manifested as both material and non-material ecosystem services (Small et al., 2017; Deplazes-Zemp & Chapman, 2021).

Regarding nature's influence on human well-being, Deplazes-Zemp and Chapman (2021) frame it as including instrumental value aspects, with the values being directed from the object (B) to the valuing subject (A). In terms of the intrinsic valuation within the relational framework, values like esteem, responsibility, and aesthetic appreciation involve a type of relationship where an individual assesses an area's worth based on its personal significance. If an individual highly values a natural area for its beauty, spiritual meaning, or out of respect, they acknowledge its inherent value, akin to assigning a monetary value to an object (B).

By acknowledging both the intrinsic and instrumental aspects of the relational values framework, Deplazes-Zemp and Chapman (2021) provide a comprehensive framework for examining diverse relational values and assessing their alterations due to the COVID-19 pandemic

2.5.1 COVID-19 and Relational Values

Morse et al.'s (2020) investigation into how the pandemic affected individuals' interactions with natural areas in the state of Vermont, and the related relational values, serves as a pivotal foundation for my research. This study is unique in its focus on relational values in the context of the pandemic, paving the way for my qualitative exploration of changing relational values for adolescents in Canton Zurich.

Morse et al. observed significant surges in outdoor activities such as gardening and walking during the pandemic. Other activities that gained popularity were relaxing alone and time spent watching wildlife, particularly bird watching. Interestingly, more active and intense methods of exercise, such as cycling and jogging, did not show any increase from pre-pandemic levels. This insight portrays a shift towards more solitary, tranquil pastimes of a reflective nature, possibly having a therapeutic function and fostering a deeper connection with natural areas.

Morse et al. (2020) highlighted thirteen relational values that they categorized into three groups: nurture and recreation, inspiration and nourishment, and a third mixed category. The relational values of nurture and recreation saw a marked increase in importance compared to those grouped under inspiration and nourishment, which included creativity, food, life lesson, and tradition. Mental well-being was the most significant value regarding participants' motivation for spending time in natural areas (Morse et al., 2020). This supports the findings of Mackinnon et al. (2022), who discussed the implication of an Urgent Biophilic behavioural response to the stresses of the pandemic. Participants' enhanced appreciation for the beauty of nature implies a deeper emotional connection fostered during the pandemic. The values related to exercise and beauty followed, with beauty relating to the appreciation individuals have for admiring natural beauty.

The uptake of nature as a 'natural gymnasium' can be partly attributed to the closure of public gyms, the requirement to socially distance, and the mental well-being benefits associated with moving the body (Venter et al., 2020). However, Morse et al. provide a different perspective on the motivations behind exercise in nature by showing the uptake of more passive forms of exercise, like walking and hiking. This implies that this relational value is deeply intertwined with the relational values of beauty and well-being. Other notable relational values highlighted were identity and spirituality. Both of these values are closely related to an individual's sense of place, which is directly linked to positive mental well-being (Tidball & Kransky, 2013), highlighting their importance in the pandemic context.

The findings of Morse et al. (2020) underscore the growing appreciation for and importance of local green spaces as therapeutic landscapes during crises scenarios. This study's findings are pertinent to my research, informing strategies for prioritizing and preserving urban green spaces within Zurich. Interestingly, Vermont, with its extensive forest coverage, bears a closer resemblance to Zurich than studies conducted in densely populated urban landscapes with limited green spaces. In contrast, Tomasso et al. (2021) reported declines in mental well-being correlated with reduced access to green spaces during the pandemic in four bustling metropolitan areas in the USA. Thus, in environments like Vermont and Zurich, where green spaces are more abundant, more positive well-being outcomes can be reasonably anticipated.

Morse et al. (2020) adopted a mixed-method approach, involving a survey with both qualitative and quantitative elements, allowing for the collection of a wide range of insightful

data. The participants' narratives, captured through free-text responses, were complemented by frequency data of specific activities and ranked importance of specific values. However, this self-reporting method might be susceptible to participant biases, a potential limitation acknowledged by Morse et al. (2020). My research will leverage one-on-one interviews to enable a more nuanced exploration of individual experiences and perceptions in a different cultural context for a specific demographic. This refined focus will offer a deeper understanding of how age and development influence the interplay between nature immersion and well-being, thus building on Morse et al.'s research foundation.

2.6 The Effects of Nature Deprivation during COVID-19

The COVID-19 pandemic created "*quasi-experimental conditions*" (Tomasso et al., 2021; p1) to study the effects of nature deprivation, or lack of nature exposure, on an individual's mental well-being. Tomasso et al. (2021) referred to these conditions in their paper 'The Relationship between Nature Deprivation and Individual Well-being across Urban Gradients under COVID-19." They highlighted the unique conditions that COVID-19 lockdowns and restrictions created, where people in sprawling urban areas had significantly reduced access to natural areas (Tomasso et al., 2021).

Gathering individual-level data of nature exposure through a range of parameters—namely views from participants' windows, particular work patterns, and locations—while considering variations in seasonality and landscapes, allowed for a more nuanced understanding of nature exposure and its impact on well-being parameters (Tomasso et al., 2021). The survey-based study across four metropolitan areas—Boston, San Francisco, Atlanta, and Phoenix—identified a strong correlation between reduced nature exposure and poorer mental health parameters. A crucial finding by Tomasso et al. was that decreased well-being parameters linked with nature deprivation were significantly offset by indirect exposure to green areas, either through windows, balconies, backyards, or gardens. This implies that even when nature exposure is limited due to lockdown and stay-at-home policies, declines in well-being parameters can be mitigated (Tomasso et al., 2021).

In relation to the context of my research, the nature accessibility and public health policy divergences between Zurich and the study's US metropolitan areas have to be taken into

account. The city of Zurich and the wider canton are abundantly green on a scale incomparable to the four US metropolitans in Tomasso et al.'s study, with over 500sq km of forest across the canton's 1,728sq km total area (Loran et al., 2018).

Despite the established connection between personal well-being and living proximity to green space (Tomasso et al., 2021; White et al., 2021), White et al. (2021) in their study 'Associations between Green/Blue Spaces and Mental Health across 18 Countries', disproved their hypothesis that high-quality green and blue natural areas within a one-kilometre radius from a respondent's address would correlate with positive mental health parameters. However, they found that it was the frequency of visits to such areas that correlated with positive mental well-being. When they adjusted their analysis to account for the frequency of visits to these areas, the initial positive effect of merely living in the greenest and coastal areas on well-being disappeared.

An insightful conclusion from the study by White et al., relevant to my research, is that the attractive qualities of green and coastal areas stimulate more frequent recreational visits, providing the individual with combined benefits of nature exposure, a change of environment, exercise, and social interactions, contributing to positive mental health parameters. In the context of my research in Zurich, such research implies that my interview respondents won't necessarily reap the well-being benefits of living in an environment with easily accessible green spaces without actively engaging with and visiting them

2.7 Nature and Well-being during COVID-19 in Different Cultural Contexts

The multitude of qualitative, survey-based studies examining individuals' usage and perceptions of urban green spaces during the pandemic show a divergence in results across different cultures. This implies that a country's lockdown measures and underlying cultural worldviews play a significant role in an individual's perception of nature and its importance to personal well-being.

In a study conducted in Brisbane, Australia, Berdejo-Espinola et al. (2021) examined people's usage and perceptions of urban green spaces during the pandemic. Around two-thirds of the participants across the city reported notable changes in their visit patterns and frequency,

attributing these behavioural changes to the pandemic and resulting lockdown scenarios. Importantly, 80% of participants reported a conscious improvement in well-being as a result of time spent in green urban areas, thus supporting the findings of Morse et al. (2020) and Mackinnon et al. (2022).

In stark contrast, a study by Xie et al. (2020) based in Chengdu, China, found a dramatic decrease in visits to urban green areas. Interestingly, Berdejo-Espinola et al. hypothesize that this difference is likely due to the different levels of lockdown restrictions between Brisbane and Chengdu. They imply that harsher regulations might intensify the need for nature's restorative effects to cope with the associated stress and isolation, a conclusion suggested by Berdejo-Espinola et al. when attributing this difference between the findings of these two studies (Berdejo-Espinola et al., 2021).

These findings have implications for my current research, due to the relatively lenient lockdown measures enforced in Switzerland. However, due to my focus on the adolescent demographic, this conclusion may not necessarily hold.

Additionally, an interesting study by Haas et al. (2021) examined the link between cultural worldviews and psychological well-being in the context of COVID-19. US participants who held a mastery-over-nature worldview reported significantly lower well-being parameters than individuals in Japan who held this worldview (Haas et al., 2021). Haas et al. attribute this finding to the concept of ‘naïve dialecticism,’ accepted across East Asian cultures, suggesting that an individual living in Japan will be more open to accepting the uncontrollable impact of a pandemic despite holding a contradicting worldview.

This perspective offered by Haas et al. provides valuable insight for my thesis, emphasizing the importance of considering an individual’s cultural context in shaping their interaction with nature and the subsequent well-being outcomes in a pandemic scenario. These insights are also crucial for discussions on relational values, as worldviews are intimately tied to how individuals value the non-material benefits of natural areas.

2.8 HUMAN NATURE RELATIONSHIPS IN ADOLESCENTS

‘Age and Connection to Nature: When is Engagement Critical?' by Hughes et al. (2019) serves as an indispensable source for the theoretical underpinnings of my thesis. This study is unique in its exploration of human-nature connectedness across diverse demographics, including adolescents—a demographic often overlooked in such research.

Hughes et al. conceptualize nature connection as a multidimensional construct, enveloping emotional, cognitive, and behavioral domains that define an individual's relationship with their natural surroundings. This investigation provides profound insights into the oscillations in our bond with nature throughout our lives, underscoring the impact of age on our attitudes towards, and interactions with, nature.

A pivotal discovery from this research is the observed dip in nature connection among teenagers, in contrast to children aged 12 and under (Hughes et al., 2019). The nadir is observed among those aged 15–16 years, after which the connection scores begin to ascend, ultimately levelling off in adulthood. This trend indicates a critical juncture during adolescence, where nature connection is at its weakest, potentially offering a window for effective intervention and rejuvenation of this connection as individuals transition into adulthood.

Hughes et al.'s study also provides a temporal context for understanding human-nature connections by laying the groundwork for "Urgent Biophilia"—the intensified reconnection with nature during or post-crisis. This concept is pivotal in exploring how global crises, like the COVID-19 pandemic, can induce shifts in adolescent nature connectedness. It emphasizes the importance of capturing the qualitative subtleties of these experiences during adolescence, thereby validating the qualitative methodology adopted in this thesis.

However, it is important to note that Hughes et al.'s study is based on a UK-based sample, and therefore, cultural and geographical differences might limit its direct applicability to the context of Zurich. This is particularly relevant to my study as I aim to explore whether a crisis scenario can modify this connection, potentially strengthening adolescents' bonds with nature. Furthermore, Hughes et al.'s research contributes to a more nuanced understanding of the Urgent Biophilia concept within this specific age group.

2.9 The COVID-19 Pandemic and Effects on Adolescents' Mental Well-being

Adolescents were especially vulnerable to the negative mental health impacts of the pandemic, attributed to major disruptions in their social and educational routines during a crucial stage of their socio-emotional development (Loades et al., 2020). The pandemic and ensuing lockdown measures have led to dramatically increased rates of depression and anxiety within this demographic. This surge is ascribable to restricted social lives, curtailed movements outside the home environment, and uncertainties pertaining to academic progress (Xie et al., 2020).

Routine disruption, owing to stay-at-home policies, emerged as a particularly detrimental aspect of the pandemic concerning teenagers' well-being (Brooks et al., 2020). Structure, predictability, and security—important pillars of mental health support in teenagers—were significantly compromised (Brooks et al., 2020). The maintenance of a structured routine is also correlated with adolescents gaining more independence from their parents and enhancing their emotional regulation (Rudolph et al., 2020). A notable increase in time spent on devices like computers and smartphones, resulting from this lack of everyday structure and augmented free time, is well-documented to have severe mental health implications for this demographic (Ott et al., 2020; Tang et al., 2021). Increased screen time is associated with adolescents developing irregular sleep patterns and experiencing a decrease in physical activity (Cellini et al., 2020; Dunton et al., 2020)—both crucial factors for sustaining physical and mental well-being.

Moreover, the stress and uncertainty associated with online learning, compounded by the feelings of isolation it induced, have been significant sources of stress and anxiety for this demographic (Lee, 2020). Despite the plethora of studies on the adverse effects on adolescents' mental well-being due to COVID-19, Loades et al. (2020) examined factors associated with mental well-being resilience during the pandemic. They determined that physical activity and time spent outdoors are indeed effective strategies for bolstering resilience. This conclusion is in alignment with the existing literature on the benefits of nature exposure and exercise to mental well-being.

2.10 Smartphone Usage and Nature Connectedness

There is an ever-increasing body of literature on the negative implications of smartphone use for individuals' mental well-being (Elhai et al., 2017; Lee et al., 2016). However, Minor et al. (2023) have identified a digital impulse inhibition that can be triggered by prolonged periods of nature exposure. They observed a substantial decrease in participants' smartphone usage in wild natural areas, such as forests, nature reserves, and meadows, over periods exceeding two hours. This reduction was particularly pronounced in individuals who normally spend significant amounts of time on their devices. In contrast, device usage was found to increase in urban green spaces, like parks, implying a spill over of digital connectivity into these spaces from other urban areas (Minor et al., 2023).

Despite device usage also declining in urban green spaces for visits exceeding two hours, Minor et al. propose a possible trade-off, with remote social ties potentially being strengthened by time spent in urban green spaces, at the expense of missing out on the well-being benefits derived from time spent in nature. This implies that the well-being benefits associated with spending time in wild areas outside an urban environment may also be linked to reduced smartphone usage in more recent studies, as smartphone usage has become the norm. It also highlights the possibility that many individuals are missing out on the benefits associated with time spent in green urban areas due to device usage (Minor et al., 2023).

Problematic Smartphone Usage (PSU), referring to an individual's inability to regulate their device use, was investigated by Richardson et al. (2018) regarding its effect on nature connectedness when spending time in natural areas. PSU is particularly prevalent within the adolescent demographic, rendering it especially relevant to this research (Firat and Güll, 2018). The study identified that increased time on smartphones and selfie-taking were negatively correlated with nature connectedness, resulting in missing out on the well-being benefits from time spent in nature. Interestingly, despite finding that selfie-taking in natural areas decreased levels of nature connectedness, using smartphones for taking pictures of nature itself could increase feelings of connectedness. This suggests that smartphones, if used mindfully, may facilitate higher levels of connection (Richardson et al., 2018).

In the context of my research, these studies emphasize the importance of considering how device use while spending time in natural areas may affect the reported positive outcomes associated with this time. It is also critically important, in the field of human-nature relationships, to contemplate how emerging technology has and will continue to alter humans' ability to connect profoundly with their surroundings and to harvest the benefits of such connections.

3 METHODOLOGY

This study aims to explore how the COVID-19 pandemic impacted adolescents' perceptions of and interactions with natural areas, and whether these changes demonstrated an Urgent Biophilic response, as conceptualised by Tidball (2012) and later adapted to the context of the COVID-19 pandemic by Mackinnon et al. (2022). Qualitative interviews were chosen as the method of data collection, targeting individuals within the 18-19 age range who had lived in Kanton Zurich throughout the COVID-19 pandemic. Qualitative research, particularly in-depth interviews, offers advantages in capturing the nuanced perspectives and personal experiences often missed by quantitative methods (Creswell and Creswell 2017). This methodological approach is particularly valuable when exploring the complex and multifaceted concepts of human-nature relationships, which are challenging to capture with quantitative metrics (Braun and Clarke 2006).

The literature identified for expansion in this thesis employs a combination of qualitative questionnaires and people count data. While such approaches effectively reveal shifts in behavior and pinpoint basic reasons for these changes, they might not fully grasp the emotional and cognitive intricacies of human-nature relationships that this research aims to uncover. Through the use of qualitative interviews, I contribute to the expanding body of literature on COVID-19 and Human-Nature Relationships. This thesis employs a blend of deductive and inductive interview techniques to allow for a more comprehensive understanding of this demographic's pandemic experiences. A semi-structured interview technique was utilized (DiCicco-Bloom and Crabtree 2006), with an interview template broadly followed. Spontaneous follow-up questions allowed the interviewer to adapt to the interviewees' perspectives and experiences (Brinkman 2013). My participant recruitment strategy relied on the convenience sampling method. The data were then subjected to thematic content analysis, using the six main steps of this type of analysis as outlined by Braun and Clark (2006).

Detailed descriptions of data collection and analysis procedures, along with considerations regarding participant selection, author's positionality, and research ethics, are discussed in the subsequent sections of this chapter.

3.1 DATA COLLECTION

The data collection for this thesis consisted of 13 interviews, following the recommendations of Guess et al. (2006), who found that information reached a 92% saturation point at 12 interviews. Therefore, the amount of new information declined significantly after this number Guess et al. (2006). Twelve of the thirteen participants were within the age range of 18-19 years old and lived in the Kanton of Zurich. Out of the thirteen interviews, one was not utilised for the final results due to the participant lying outside the 18-19 age range and living outside of the Kanton of Zurich. The 18-19 age range was chosen to investigate the experiences of these participants when they were in the 15-16 age range at the start of the pandemic. This is an age bracket that Hughes et al. (2019) identified as having the lowest level of human-nature connectedness pre-pandemic, and therefore was identified as an interesting target demographic for this thesis. A unique opportunity was therefore identified, where young adults between the ages of 18 and 19 could be interviewed in 2023, having experienced the start of the pandemic as 15- and 16-year-olds. This allowed for the avoidance of the complicated legislation associated with interviewing minors.

All of the 12 interviews used in the results were students from the gymnasium Kantonsschule Zurich Nord (KZN). Participant selection is expanded upon in **3.3**, later in this chapter. The interviews were all conducted in English; however, the interviewees were clearly informed that they could answer in German at any time if they struggled to express certain thoughts and feelings in English. The choice of conducting the interviews in English was seen as a compromise for recruiting participants from KZN, due to my robust network of contacts within the English department, established through my past employment at this institution as an English Language Assistant. English teachers at KZN were therefore willing to assist me in recruiting interview participants, valuing the premise that the interviews would provide beneficial English-speaking experience in an interview scenario for the sixth-year students in the lead-up to their Cambridge English and Matura exams. Alongside this, the student participants expressed motivation to take part in the data collection, partly due to the incentive of experiencing an English-speaking interview scenario. Despite only two of the participants being native English speakers, the English proficiency of all participants was at an advanced level. Therefore, the compromise of choosing English as the interview language is

not considered a hindrance to the quality of data collected. Also, as a native English speaker myself, I was more spontaneous and expressive during the interviews than if they were conducted in German.

3.2 THE INTERVIEW PROCESS

The aim of the interview was to gain a complete and comprehensive understanding of the participants' experiences during the pandemic in relation to how they interacted with, spent time in, and felt about local natural areas before, during, and after the pandemic. An interview guideline was used that was updated following an initial pilot interview to refine the question content and framing. This refinement practice is common in qualitative research and is referred to as emergent design (Creswell, 2016). The guideline was designed based on the identification of key themes from a broad examination of the literature. The guideline was designed to give the interviewer a clear structure and overview of what areas needed to be explored, with sufficiently open-ended questions that served effectively as a springboard for discussion and the exploration of further themes. In light of the semi-structured nature of the interviews, flexibility and spontaneity were key elements of the interviewing process, with the guideline offering more of a road map than a script. The interview process therefore utilised both inductive and deductive techniques, with new themes emerging and being added to the guideline. An example of this inductive technique involved exploring the relationship of smartphones and other devices, with adolescents' mental well-being and nature connectedness throughout the pandemic. This approach worked well with the 18–19-year-old participants, as it allowed them to express their unique experiences and perspectives in a more relaxed, open-ended format than a rigid adherence to the guideline might have permitted. However, it is important to note that adopting such an approach didn't distract the interview from the foundations of the research objectives and research question.

All thirteen interviews were conducted in person. The longest interview lasted 54 minutes, the shortest was 20 minutes, and the average duration was 37 minutes across all 13 interviews. The twelve interviews with KZN students were all undertaken in the University of Zurich political science building, due to its close proximity to KZN, which the students pass on the way to Oerlikon train station. I suggested this location due to its convenience and

familiarity with the participants, coupled with the abundance of quiet seating areas, and being an official UZH building, which subtly underscored the seriousness and importance of the research for the young participants. As all the students already knew me from my time working at KZN, rapport between myself and interviewees was already established prior to the interview. This pre-existing rapport seemed to foster a relaxed and conducive atmosphere for all the interviews, which is likely to have encouraged the participants to share their experiences more openly and comfortably than if the interviewer had been a stranger.

In preparation for the first interview, a pilot interview was undertaken, alongside a thorough evaluation of the research goals and existing literature.

3.3 RECRUITMENT METHODS AND PARTICIPANT SAMPLING

One of the factors that led me to select this demographic, alongside the interesting implications from the Hughes et al (2019) study, was the abundant contacts I had in the English department at KZN. I also had contacts at Hull's International School in Zurich, and therefore the initial target was to recruit participants from both of these institutions.

As an initial recruitment attempt, a virtual poster was made, which included clear and basic information about the interview's topic and target demographic. An important feature of this poster was a QR code, which interested parties could scan with their mobile device, leading those interested to a Google forms document where they were directed to provide their name and contact details. This would allow me to contact those interested directly, rather than relying on the interested party to make initial contact with me. This poster was sent to my contacts at KZN and Hulls International School, with the request that they briefly showed this virtual poster at the start of their sixth-year classes that included students aged 18-19 from the target demographic. This poster was also printed out and displayed on a notice board at Hull's International School. The success of this recruitment method is attributed to the QR code, as it allowed interested parties to use their mobile phones to virtually give me their contact details with very minimal effort. Ten out of the twelve interviews from KZN students were recruited through this method, with two being recruited through word of mouth from students I had already interviewed. This recruiting method therefore resembles

that of the convenience sampling method, allowing me to capitalize on my pre-established connections, given the inherent difficulties in recruiting the study's chosen demographic. This recruitment difficulty was reflected in my failure to recruit participants from Hull's International School.

The choice of participant sampling is considered critical in determining the validity of a study's results, as it determines the extent to which findings can be generalized, reliable, and valid (Miles and Huberman, 1994). Therefore, a well-conducted sampling process should include participants that adequately and as heterogeneously as possible represent the studied demographic. The quality of participant sampling was maintained by ensuring that the participants matched the age range and location criteria. This is reflected in the one interview that didn't fit this criterion, being 20 and living in the canton of Sankt Gallen, being excluded from the results. All the participants were 18 or 19 years old, and had lived in Kanton Zurich throughout the entirety of the pandemic. Despite the convenience sampling method being employed, there was a relatively even split of male and female interviewees, with 6 males and 7 females. Interviewees within the study's sample guidelines must be as diverse as possible, which in this study's context includes gender, parental origins, and living location across the Kanton of Zurich. Factors such as educational background could not be diversified. All the participants were Gymnasium students, meaning they comprised the top 20% of students in terms of academic ability within the Swiss three-track secondary school system (Hofer et al., 2017). Due to this, a selection bias may have been incurred, with this sample perhaps not fully representing the broader population of adolescents in Kanton Zurich due to potential shared experiences or perspectives specific to this school environment (Etikan et al., 2016).

3.4 DATA ANALYSIS

3.4.1 Transcription

The interviews were recorded and transcribed into word document format. The transcription software from app.transcriptor.com was used to convert the audio files into text. This converted text was then carefully cross-referenced with the original audio, to check for any inaccuracies in the transcription conversion. Any inaccuracies, predominantly concerning place names, were corrected during this process. Through the utilisation of this accurate audio to text software, I was able to optimize the transcription process by freeing up substantial time for further analysis and interpretation of the data. The accuracy of the transcription was not impacted by this decision. Although prarticipants were given to opportunity to express themselves in German, all interviews were conducted in English. Consequently, no translation was required during the transcription process.

The resulting word document of this transcription was imported into the qualitative data analysis software MAXQDA. This analysis of the transcription using MAXQDA provided the results for this study.

3.4.2 Qualitative Content Analysis

Using the MAXQDA software, initially an open, inductive coding system was used, whereby the coding system was developed while reading through the transcripts, and emerging organically from the content (Corbin and Strauss, 2008). As this process went on, subcategories to the initial codes were introduced, which facilitated the identification of the major and minor themes in the transcripts. This initial inductively created coding system was then applied deductively to later transcripts, through a dynamic process that was constantly being refined. Transcripts were all read multiple times, and those initially coded were then re-visited later in the process if new codes or sub codes were identified from later transcripts. Figure 3 provides an example of how the transcripts were coded using this software, portraying how a main code, such as ‘Relational Values’, contained many more specific sub

code categories. The 7 main codes with 60 sub code categories were created to identify recurring themes, their importance for the research objective and their ability to encapsulate overarching ideas that occurred across all the interviews. These 7 main code groupings included:

- Temporal perspectives
- Geographical themes
- Demographic Factors
- Nature Connection
- Relational Values
- Pandemic Impact
- Digital Engagement

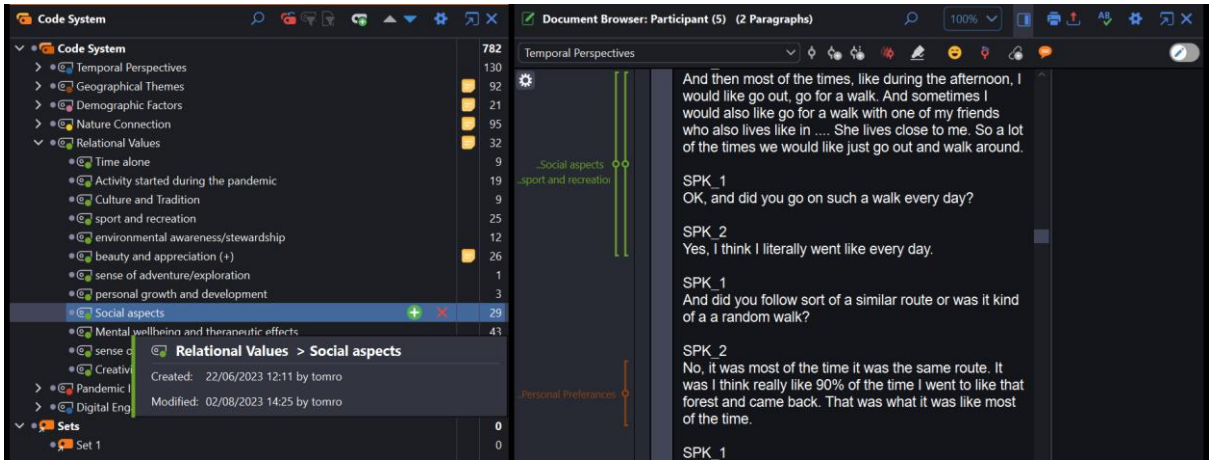

Figure 3 Researcher's screen shot of data analysis in MAXQDA software

3.5 STUDY AREA

The Kanton of Zurich, illustrated in Figure 5, was chosen as the study area for this research. A practical rationale for selecting this region, was it being where the University is located, alongside being the location of KZN, where all the participants attended. Despite the logistical advantage, investigating this study's objective within a specific canton of Zurich context, allowed for a more specific contextually grounded understanding of human nature relationships during the COVID-19 pandemic.

The diverse geographical features and meticulous land-use planning within the Canton of Zurich create a unique backdrop for this research. Zurich is the most populous canton in Switzerland, with 1.5 million residents (Federal Statistics Office, 2019), with the city of Zurich itself being the largest city in the country. With the highest total GDP and the fourth highest GDP per capita (Federal Statistics Office, 2022), the Kanton is also among the wealthiest out of all the cantons, which is reflected in the high cost of living and corresponding high salaries. Despite its relatively dense population and large urban areas, the canton of Zurich is comprised of 30.7% forest, which equates to over 500 square kilometres of forest out of the canton's 1,728 square kilometre area (Loran et al., 2018). This very high area of forest coverage is attributed to strict laws at a national level, which prohibit the forest area from decreasing (BAFU, 2021). Complementing the rich mosaic of forest and farmland across the Canton, are 14 lakes, with the largest being the Lake of Zurich, and 13 rivers passing through the Canton. Residents therefore have a diverse array of possibilities to partake in outdoor recreational activities close to their homes, which is only enhanced by a world leading public transport system and diverse hiking and cycling path network.

Another notable detail of this study area, and of Switzerland in general, is the relaxed COVID-19 lockdown restrictions compared to other western European countries. Despite long periods of virtual schooling and home office requirements, individuals were still allowed to meet with up to five friends or family at any one time, throughout the entirety of the pandemic. This may have resulted in fewer feelings of isolation and the resulting well-being implications than experienced in other countries, which is of great relevance to the study. Moreover, outdoor recreational activities were largely unrestricted, offering the residents of

Canton Zurich with an additional outlet for physical activity and social interaction, which were severely restricted during lockdown periods in countries like Italy and the UK.

Figure 4 Canton of Zurich map. (Source: Tschubby, 2009)

3.6 POSITIONALITY

In order to present the study's findings as transparently as possible, especially considering the qualitative nature of the results, it is important to reflect upon the researcher's positionality (Dwyer & Buckle, 2009). Firstly, I am an avid outdoor sportsman and hold a Bachelor's degree in ecology. It is therefore likely that my perception of the human nature relationship has been shaped by my hobbies and experiences. Consequently, my interpretation of the participants results may have been influenced by these factors, and may have subtly influenced the interview process, and potentially introduced a bias in how I formulated the questions (Rose, 1997).

Secondly, having worked at the school where the participants study, meant that I had existing relationships with some of the participants. As previously discussed, I believe this created a positive environment, potentially encouraging the participants to be more open. However, it must also be mentioned that this could also inadvertently introduce bias, as I might interpret responses based upon prior knowledge of the participant. Furthermore, due to my primary role as an English conversation facilitator at KZN, there's a possibility that I reverted to this role, potentially diluting the research question focus (Dwyer & Buckle, 2009).

In order to address these potential biases, I actively sought to bracket any assumptions or preconceptions during the interviews. In practice this meant consciously acknowledging how my previous experiences, and knowledge of some of the participants, and actively worked towards this not effecting my questioning and interpretations of the participants answers. In the formulation of questions, I strived for neutrality, in the sense that my phrasing didn't implicitly reflect my personal experiences.

Acknowledging these aspects of my personal and professional background underlines the interpretive nature of this research, and highlights how these aspects could affect my positionality during the interview process (Rose, 1997).

3.7 ETHICAL CONSIDERATIONS

Ethical considerations in this study took precedence, especially given the sensitive nature of the theme of mental well-being alongside the younger age demographic of the participants (Santelli et al., 1995). The participants verified their age prior to the interview, ensuring they were all at least 18 years old. This decision was taken due to the complexities of interviewing individuals under 18, which requires obtaining parental or guardian consent and addressing heightened concerns regarding vulnerability and confidentiality.

Securing informed consent is a fundamental principle in conducting ethical research in the field of social science (Fargas-Malet et al., 2010). Prior to meeting for the interview, the participants were informed of the interview topic, and were asked if they had any questions that they wanted clarifying. Upon meeting, the participants were provided with an informed consent form (Appendix **8.1**) to sign, which described the purpose of the study and outlined that they could abstain from answering questions at any time. This underscored the voluntary nature of their participation.

The confidentiality and anonymity of the participants were prioritised throughout the study. All participants were asked permission for the interview to be recorded, and they were informed that the audio and transcripts would only be viewed and analysed by myself, the researcher. However, they were also made aware that some specifics of their shared information might potentially allow friends or family to identify them in the results section, which they agreed was acceptable.

Participants were informed about the academic uses of their responses and were offered access to the finished thesis. The interview recordings were securely stored on the interviewer's password-protected laptop, and not shared with any other individuals or sources, maintaining the participants' anonymity. These recordings will be deleted one year after the thesis submission.

Special care was taken when broaching the topic of mental well-being, a sensitive issue across all demographics, particularly among young adults and adolescents. The questions regarding mental health during the pandemic were carefully crafted to focus more on the situation's context and the behavioural response to emotions rather than delving into deep

psychological aspects. In the event that any participant showed emotional distress, the interview would have been paused immediately and only resumed with the participant's consent. Notably, some of the participants expressed gratitude to have been offered an opportunity through which they could reflect and share their experiences from the pandemic. Such a reflection is important to mention, being relevant to the ethical considerations of the study.

4 RESULTS

In this section, the findings from the qualitative data analysis are presented, following the thematic approach adopted in this research. The analysis seeks to answer the primary research question: "How has the COVID-19 pandemic influenced adolescents' relational values toward and interactions with natural areas, and if these changes are present, how do they manifest as indications of Urgent Biophilia?" Concurrently, it addresses the two sub-questions that focus on the observed changes in interactions with natural areas and the adolescents' relational values toward nature before and after the onset of the pandemic. The findings are organized according to the themes identified during the analysis process. Each theme is discussed individually, highlighting commonalities, discrepancies, and unique insights provided by the participants. Through this thematic exploration, the section aims to offer a distinctive perspective on adolescents' evolving relationship with natural areas during the COVID-19 pandemic.

4.1 DEFINING NATURAL AREAS

In this study, references to nature and natural areas are habitual, making it crucial to define what constitutes such areas from this study's standpoint. Interview participants were informed that a natural area could include any space with green or blue elements. These can range from a balcony adorned with several potted plants to gardens, urban parks, dense forest areas, and bodies of water. This comprehensive definition recognizes the significance and potential impact of various forms of interaction with nature, not limited to those occurring in traditionally 'wild' settings. By considering a broad spectrum of environments, particularly urban green spaces, this study aims to capture more accurate and inclusive representations of adolescents' interactions with nature.

4.2 Defining Well-being

Well-being is a term used throughout this study to describe a broad and multifaceted concept referring to an individual's overall quality of life. It encompasses a holistic understanding of an individual's physical, emotional, and social health. While mental health is a pivotal component of well-being, this thesis, with its human geographical focus, opts for the term well-being due to its intrinsic link with individuals' surrounding environments and the broader context of their lived experiences. Therefore, this study adopts a wide range of themes reflecting positive lived experiences of participants during the pandemic to indicate parameters of positive well-being.

4.3 Defining the Pandemic Time Frame

This study investigates the impact of COVID-19, a global health crisis that began in early 2020, focusing on the ensuing measures and restrictions that extended until the beginning of 2022. During this period, individual countries enforced fluctuating rules and regulations. Although Switzerland implemented comparatively moderate measures compared to neighbouring Western European countries, these changing regulations inevitably affected the lived experiences of Swiss residents on a temporal basis, particularly impacting the adolescent demographic that experienced periods of home and virtual schooling. Furthermore, since there is no definitive end to this global crisis, an element of subjectivity is introduced when discussing experiences that occurred 'during' and 'after' this period. As the interviews were conducted between March and June 2023, many participants found it challenging to discuss very specific time frames throughout their experiences, especially the early stages three years prior. However, they managed to discuss the entirety of their experiences during this period more abstractly. Given these considerations, this study adopts a holistic approach to the effects of COVID-19, encompassing the entire period from the first lockdown in Switzerland in March 2020 until the start of 2022. This approach allowed a more comprehensive exploration of the full scope of the participants' lived experiences without the struggle of differentiating between very specific dates and time frames, providing a more authentic insight into the participants' behaviours, attitudes, and feelings in response to this health crisis.

4.4 COVID-19 AND WELL-BEING AMONG ADOLESCENTS

The initial reaction of participants to the pandemic and resulting lockdown measures appeared to be overwhelmingly positive, characterised by relief and optimism. This sense of relief was described as being attributed to the decrease in school pressure that occurred with the shift to remote learning, and the resulting free time that this made available. Many of the participants commented on their initial scepticism regarding the personal and societal effects that the pandemic posed, with this undertone of initial positivity underlining eleven of the twelve interviews:

> *“To be honest … I was kind of a lazy kid, so … when the school told us to stay at home or have classes online, I was … kind of happy that the pandemic started."* (Interview 10)

> *"I wasn't really scared of it because I thought I was young … and it couldn't really do anything.”* (Interview 1)

> *“I don't think really it really impacted me because before the pandemic I didn’t go outside much, so nothing really changed.”* (Interview 7)

> *“I quite actually enjoyed the whole experience … but I actually quite liked it and being at my house. Kind of having a bit of a break from everything.”* (Interview 8)

This initial positivity and nonchalant attitude towards the situation seemed to have been replaced with elements of negativity relatively early on in the first lockdown period, which was associated primarily with disruptions of routine, feelings of confinement, and social isolation. Excessive device use was a prominent theme in all twelve of the interviews, which was facilitated by the abundance of leisure time and virtual schooling:

> *"At one point I started to think like I am going crazy in this house... I feel trapped."* (Interview 10)

4.4.1 Disruption of Routine

The disruption to participants' day-to-day schedules and the consequent impact on their individual well-being emerged as a major theme in all of the interviews. The elimination of routine activities—most notably, physical school attendance, sports clubs, and social events—left participants with a surplus of free time that necessitated alternative engagement. This cessation of scheduled activities initially led to an uptick in sedentary lifestyles, especially among participants who were heavily involved in sports before the pandemic. One participant experienced weight gain as a consequence of this shift, with the cancellation of scheduled events, including sports and school, contributing to an overall loss of life balance:

> *"I lost the balance between school and sports and nature … because of this, I did a lot less in general. I just stayed at home."* (Interview 12)

The shift to virtual school was initially perceived as freeing and exciting by several participants but quickly became a source of frustration. It also led to feelings of social isolation and fostered excessive device usage. One participant felt forgotten and insignificant due to the impersonal nature of online classes. Another theme that emerged across several interviews was the disruption of the traditional dichotomy between the home environment and school by the transition to virtual schooling. This intrusion of academic responsibilities into the home influenced participants' perceptions of place and space:

> *"I [associated] my home to be a place where I can relax and be like, ohh, I don't have any responsibilities. I only have responsibilities at school … And then the responsibilities came home. And then I felt like home wasn't a place to relax anymore."* (Interview 10)

The transition to virtual schooling significantly impacted this participant's mental compartmentalization of space. They had strongly associated their home environment with a sanctuary, a place to relax and unwind, free from responsibilities. However, the obligation to undertake all schooling activities within this space altered this perception. This participant felt that the sanctuary of home was invaded by the responsibilities and pressures previously confined to the school environment, diminishing the sense of relaxation and sanctuary they had once felt at home.

4.4.2 Excessive Device Usage

The most salient factor mentioned in all twelve interviews regarding negative well-being was the excessive amount of time the participants spent on electronic devices compared to pre-pandemic levels. Terms such as “addiction,” “binge-watching,” and “attached to” were frequently used to describe their relationships with these devices. The platforms and apps mentioned as being the most addictive included TikTok, YouTube, and Netflix. Many participants stated that this behaviour was intensified by virtual schooling, which required students to be on their devices for extended periods for academic purposes.

> *“I was always kind of addicted to having my phone because it was a good distraction. It wouldn't make me think about the bad stuff. And so I just really got attached to the phone. All the lessons were on computers … which is basically like a big phone. And I was really, like, stuck with electronics.”* (Interview 1)

This participant illustrates how virtual schooling contributed to a rise in device addiction by noting they were “*stuck with electronics*.” Additionally, the abundant free time spent at home was often occupied by using smartphones, playing video games, and watching content on streaming platforms:

> *“I started using my tablet iPad for school. So that's like 4 to 7 hours a day just on top the time I spent after school on social media. It really took off because it's just so easy to distract yourself ... So yeah, I think it really got to a point where it's not healthy anymore.”* (Interview 3)

> *“I spent the time where we should have school playing video games … there wasn't really any control.”* (Interview 7)

The participant in Interview 3 commented on the escape and distraction that this provided from the strange situation and acknowledged that this was an unhealthy habit and therefore bad for personal well-being. One participant summarized the dual nature of this shift as both a growing habit and a source of isolation:

> “*Addiction to electronic devices in general. I think it really increased during the pandemic, and I think that also isolated a lot of people … For me, I've never been that*

person who spends a lot of time on their phone, but I did develop this habit, so I think that was like the worst thing for me personally." (Interview 4)

This participant acknowledged that increased device usage was "the worst thing for them personally," as well as increasing their feelings of social isolation, sentiments that were reflected across all the participants' responses. Despite several participants commenting on the social facilitation of online games, which made them still feel socially connected, the majority of participants described the resulting social isolation from this habit, alongside frustration and regret related to the increasing amounts of time that this behaviour consumed:

"I feel like I could have done a lot more … I could have been a lot more productive during the pandemic instead of just being on my phone" (Interview 6).

This participant's comment portrays an element of regret, regarding the amount of time that they spent on their device throughout the pandemic. Several participants also commented on how this habit, alongside the general disruption to everyday routine, significantly impacted their sleep schedule, which had severe consequences for these individuals' well-being. It is evident from the participants' narratives that parents and guardians did not play a significant role in moderating the development of device addictions and other unhealthy habits related to routine disruption during this period.

4.4.3 Social Isolation, Frustration and Boredom

The themes of social isolation, frustration, and boredom emerged as interconnected minor themes that characterized the negative aspects of the participants' experiences and contributed to their overall well-being. As mentioned earlier, social isolation was intricately linked with the disruption of normal social routines, which in turn led to feelings of frustration, loneliness, and the fear of missing out:

"I saw how some friends would still hang out even though they couldn't … I was a bit jealous and also wanted to go out, but it was forbidden and my parents would also

not allow that …I just always felt like I was being left out. And yeah, it was kind of weird being always at home and never being out." (Interview 1)

This participants comments reflecting an experience of mild social dissonance, especially in the early stages of the pandemic, was reflected across many of the interviews. One of the participants commented on how they found the changes in social dynamics between individuals, as a result of socially distancing and mask wearing, an upsetting and isolating experience:

"There were many restrictions and many people were afraid to talk with you. People [were] just like [maintaining] distance with you, and it wasn't enjoyable."
(Interview 12)

The emotion of frustration was also a prominent theme in all the interviews, especially when discussing the later stages of the pandemic and the continuing regulations:

"After some time it just got a bit too much, I think, especially as all these regulations got even stronger and we had to wear masks in school. Just quite a change … And I think over time it just got like a bit depressing because it didn't change, it didn't get better over time. Well, for some time at least." (Interview 3)

As this participant mentioned, the rapidly changing situation created an environment of uncertainty, which manifested in feelings of frustration and dissatisfaction. From the necessity of wearing masks in school to adapting to evolving regulations, the participants described a tangible sense of difficulty and unease, which underlined all the participants' experiences after the initial excitement of being able to stay at home had worn off. Alongside these emotions, boredom was a theme that emerged in many of the interviews, especially in cases where the participant was highly active, both socially and physically, before the pandemic. Comments such as "*Over time, I did start getting bored at home*" (Interview 5) were characteristic of all the interviews. This undertone of boredom, coupled with frustration surrounding the situation, sets the stage for understanding the behavioural changes that were to emerge in the participants' interactions with natural areas. As the initial appeal of staying at home faded and the constraints of the pandemic intensified, the participants' emotional landscape became more intricate. This is important context for setting the scene

for the subsequent shifts in participants' attitudes toward and interactions with local natural areas.

4.5 Nature as a Refuge: A Shift in Motivations and Engagement

Having presented the results regarding how the pandemic impacted the participants' well-being, we can now turn to the behavioural changes that such impacts initiated. Ten out of the twelve participants reported an increase in their interaction with and appreciation of local natural areas during the pandemic. Before the pandemic, participants predominantly interacted with natural areas for recreational and social purposes, characterized by group sporting events, casual meetups, and trips with parents. While these types of activities remained important aspects of the participants' experience, the pandemic introduced a nuanced shift in their engagements and the values embedded in such interactions. This trend, along with the types of interactions and the underlying motivations, will be explored in this subsection.

4.6 Nature as an Escape

For the eight participants whose pandemic experience involved increased time spent in natural areas, escapism was a major value that time in nature provided. One participant commented that their time spent in the forest next to their house was *"a subconscious escape method"* (Interview 10), while another participant described their motivation for venturing outdoors as "*the feeling of not being bound to a chair*" (Interview 6). These feelings were not isolated to these participants alone, as many participants described their interaction with nature as a refreshing distraction from the feelings of confinement and the stresses of school:

> *"So the motivation behind it, I think, was that now that I didn't go to school anymore, so I didn't really have a reason to leave the house…I still wanted to take care of my well-being and still be healthy and exercise…and just get out of the house to breathe some fresh air. And maybe sometimes when I got tired of doing school work I would go for a walk to like distract myself."* (Interview 5)

Interview 5 provides a vivid account of how nature served as a sanctuary during the pandemic. A notable aspect of this participant's experiences was their association of natural areas with feelings of freedom and rejuvenation, which was reflected by the frequent use of words like 'fresh air,' 'refreshing,' and 'space.' In contrast, home and school environments, alongside the responsibilities they entail, were often described as confining and restrictive. Many participants echoed these sentiments, reinforcing the contrast between the spaces of home and natural areas. This may suggest, as addressed in **4.4.1**, that home schooling and lockdown restrictions may have affected the participants' mental compartmentalization of the home environment as a relaxing and rejuvenating space:

> *"Because it wasn't nice being inside all the time when you felt like, yeah, it just felt very closed off, [especially] with the whole world being in the state that it was. So yeah, I definitely spent more time outside and felt more drawn to going outside, especially with my friends and because we couldn't meet up inside. So that was an [important] reason."* (Interview 8)

This observation is portrayed in Interview 8, with this participant mentioning that meeting friends in outdoor areas was the only option during the periods of restrictions. This highlights the dual role of natural areas, not only as an escape from the confinement of spending long periods of time at home but also as vital social spaces during the pandemic. Natural areas' facilitation of social interactions will be examined further in **4.8**. The essence of the freedom and space that natural areas provided is further elaborated on by this participant:

> *"I think it made me appreciate [natural areas] a lot more because I wasn't constantly [confined] inside my home, so it was like so much more space. It was so much more space and it felt so freeing and peaceful, and it was like a change of scenery as well."* (Interview 6)

This participant puts great emphasis on the word 'space,' which suggests that natural areas didn't only offer them a physical space but also a figurative respite, mentally and emotionally, from their home environment and the stresses of everyday life. Another insight into how the pandemic changed participants' associations with place and space was the discussion of urban areas in relation to natural areas. This theme contrasts urban and natural areas.

4.6.1 Urban versus Natural Environments

Many of the participants talked about urban areas in a negative light, in contrast to their local forest, parks and waterside areas:

> "I just value the feeling of being in nature because here in Zurich I don't get that very often. So just being away from the city … I don't know why, but it's just a nice feeling." (Interview 7)

Two participants described how they associated the urban areas of Zurich with the dangers posed from COVID-19, due to the number of people within such areas. This was in contrast to the forest areas where they felt safe from catching the virus.

> *"I don't like the city in general … So with COVID, it was just [amplified] because there's obviously a lot more people. I knew going into a forest wouldn't make me sick."* (Interview 6)

> *"I always knew that it came from the urban areas. Like it's more dangerous in the urban areas than in the woods. The concentration of people is so big in the cities, in the urban areas that automatically it gets much more dangerous there than like outside, like outside the city*." (Interview 10)

Despite the other participants saying that they didn't associate the threat of the virus with urban areas particularly, the theme of the possibilities of escape and refuge in natural areas was still present. When asked if they believed their experience throughout the pandemic would have been made more difficult if they had lived in a more urban environment than Zurich, all the participants answered yes, which shows an acknowledgement of how living in green urban areas, in close proximity to natural areas contributed to their quality of life. This general negativity that emerged when discussing urban areas, appeared to be associated with the pressures of school, and the feelings of uncertainty that the pandemic posed. These associations were however not directed towards natural areas, which signifies the elements of escapism they were associated with.

Three participants were particularly descriptive of their general dislike of modern urban areas, and how being in such places made them feel. Despite acknowledging that Zurich had

many green elements in comparison to other cities, they still thought many of the undesirable elements of urban areas applied to Zurich. These participants used the common language of "*ugly*", "*unnatural*" and "*unhealthy*" when describing such built up areas, and contrasted them sharply with the refreshing and healing qualities of natural spaces.

> *"With architecture in the city I am more of the guy who likes a bit more older buildings, because the new buildings are very impractically built and ugly. So it's a combination of impractical healthy of living in there because it's usually one giant room and some other flats and it just doesn't look good. It's glass and sealed buildings or just blocks of that aren't even coherent in some sense. And then the nature is wild. It's just has a creativity, it has a lot of [features] that you can't find anywhere else. And, well, nature is kind of also a healing thing, because when I was little, my parents said that if you're sick and you should go outside to get some fresh air to get better, you can hug a tree and the tree will help you in some way."* (Interview 9)

Interview 9 highlights how they see modern urban areas as 'impractical' and lacking creativity, in comparison to the wild and creative attributes that natural areas provide. This was the only participant that highlighted nature as a source of creativity and inspiration. Such views on modern architecture were also reflected in interview 6, with the participant referring to the 'minimalist' and 'clean' design as unnatural, when discussing how urban areas make her feel. Through sharing a childhood belief, regarding the healing benefits of hugging trees, the participant in interview 9 paints a picture of nature as not merely a place to be, however a living entity that can be connected with:

> *"I think the pandemic helped me to understand that I am a person who likes to spend time in nature, and it also calms me very much and it gives me time and space to think and to reorganize my thoughts. And it's just like a break from everything that is going on in society and like buildings and … concrete streets and everything that is made by humans. I don't think it belongs to human nature … I think we have developed such a complex structure of … everyday life and it's just like everything is so not real, it doesn't feel real."* (Interview 10)

Similarly, Interview 10 gives us an insight into this healing quality and respite from the urban areas that the participant describes as "*not real*". Interestingly, they also show their association of the pressures of society with buildings and urban infrastructure like streets. This association between urban infrastructure and societal pressures illustrates a broader cultural perception of urban life as something synthetic and disconnected from human nature. The pandemic scenario and resulting regulations clearly added to 'societal pressures', making the idea of natural areas as means to escape and rewind more alluring during the pandemic. It's important to highlight that these views presented interview 9 and 10 were more elaborated and nuanced that those expressed by other participants, and therefore may not be reflective of the entire group. Both of these participants however give us a very deep insight into the values related to escapism, healing and well-being benefits that spending time in nature gives them.

Other participants further delve into the dichotomy between urban and natural areas, by introducing the values that they associate with such areas, that is unattainable in the hustle of urban life:

> *"Also, like how quiet [nature] is, and how calming and peaceful. Sometimes when you spend too much inside the city, and then you just want to go there and relax a bit and look at the sunshine."* (Interview 4)

> *"I live in a place where there's still kind of like these green places and there's nature. It's just a different feel. It's different now when you live in a city, just the whole vibe, the atmosphere is, it's different. And also like, for example, you know when you take a walk and there's a sunset that you see in nature or like a greener area, it's very different than when you see it in the city in my opinion."* (Interview 5)

Both participants in Interview 4 and 5, describe the atmosphere in urban areas, as distinctly different from what they experience in natural spaces. This difference is not only a sensory experience for the participants, however the experience of deeper relaxation that the quiet, calm and peaceful conditions can facilitate. The reference to sunlight and sunsets, both simple joys, reflects a desire by both participants to connect at a more organic level with their environment, that they find is diminished within urban areas, with demands of urban life somewhat filtering the experience.

Although, in general the participants did not strongly associate the threat posed by the virus with urban environments, the pandemic seemed to magnify the discomfort with modern urban areas, and for some, enhancing their awareness of what they value in their surroundings, particularly revolving around the values associated with escape and renewal. The subsequent sections with explore the participants specific values and perceived benefits that spending time in natural areas provided during the pandemic.

4.7 Natures Impact on Mental Well-being

The acknowledgement of nature's role in bolstering mental well-being and its overall therapeutic effect throughout the pandemic was a major theme in eight of the interviews. Well-being is a multifaceted and complex topic, intertwining with every aspect of human-nature interaction and holding direct relevance to every section of the results presented in this study. Consequently, this subsection will focus specifically on participants' references to the therapeutic benefits they experienced for their mental well-being from spending time in natural areas during the pandemic. As well-being benefits were linked to other activities that spending time in nature facilitated, namely social interactions, time alone and exercise, these will be addressed specifically in subsequent sections, despite large overlaps within this theme. The therapeutic effect of sitting or walking in natural areas, directly linked with passively spending time there, was experienced by many of the participants:

> *"I just wasn't feeling that that good because school had started and quite a few other things like came together. I think I went down to the river and just sat there listening to music. That was just a good time to, like, overthink all the things happening … I feel worse if I haven't been outside for a long time … It really affects my mentality and the way I think."* (Interview 3)

The participant in Interview 3 reflects an intrinsic relationship between spending time by the river and its surroundings, with their mental well-being. The therapeutic benefits experienced by this participant were consciously utilised as a coping strategy for the increasing pressures associated with school and other life events within the pandemic's context. The reliance and

acknowledgement of this therapeutic benefit is expressed through the participants acknowledgement that staying indoors has negative implications for their mental well-being. Interestingly, this observation was acknowledged by every participant, even from those whose experience of the pandemic had not facilitated more frequent interactions with natural areas. This theme is further reflected in Interview 11, where a location by water is similarly utilised by a participant to cope with the pressures of school during the pandemic:

> *"I wasn't feeling very good because I had this big exam coming up in chemistry and I was already failing. And then the night before I was like, I'm not going to study a lot more because it has no use. [there was a lake] quite close to where I lived so I could just bike there or walk there in like 5 minutes. So I went there and lay just looking at the water … looking at the trees and I remember just sitting there and that was the best thing I could have done to prepare for what was stressing me out for that exam, and I I ended up not failing … but I do really have that memory of just lying there next to the water, hearing the water and that really calming me down … I like hearing water just like the sound of it really calms me down. But when I'm in the forest I usually wear my noise cancelling headphones and I just listen to like some calm music. So that's not really the natural aspect of it. I think that's more the seeing of the nature and just like being in nature itself, that's best for me, yeah … I don't know if other people experience this too, but I instantly feel better when I'm outside in nature. Like now for example, the sun is out and I just. I feel good. Although I know I have like homework do and I do have some things I have to do, but. Yeah, it took me a while to realize that nature is so good for like, our mental health. And I guess that's probably the biggest thing you can take away"* (Interview 11)

Living in close proximity to water encouraged both participants to use these locations as soothing environments that facilitated contemplation, relaxation, and mental preparation. The therapeutic impact of spending time next to bodies of water emerged as a recurring theme in many of the interviews, as demonstrated in both Interview 3 and 11. The simple act of spending time in natural areas to bolster well-being is emphasized in Interview 11 when the participant describes the visual stimulation of being in the forest as more important than the sounds themselves. This highlights that even within natural settings, individual

preferences and practices can shape the specific ways people connect with their environment, underscoring the multifaceted and subjective nature of this relationship.

Many of the therapeutic benefits that the participants experienced through spending time in natural areas were experienced when they were alone. Despite some participants reflecting that social isolation was one of the main difficulties during the pandemic, they interestingly commented on how they valued the solitude and calmness that being in nature offered, in contrast to other environments where they felt surrounded by people. As siblings and parents were also working from home for many participants, the solitude and relaxation that they may have experienced in their home environment prior to the pandemic was disrupted. This shift in place perception may have made natural areas the only option for experiencing the rejuvenating benefits of solitude during the pandemic. This is also expressed by the participant in Interview 11:

> "*Sometimes I feel like in school or at home, there's just too many people everywhere. And then I just really, I associate nature with like being alone and just being to myself and calm. So that's yeah, what really helps there."* (Interview 11)

The solitude that can be experienced from spending time in natural areas was described as a highly positive experience by eight participants. This time alone was described as "*calming*" and "refreshing," and contrasted sharply with the descriptions of social isolation that the pandemic induced for some participants. This is interesting, as it appeared that time spent alone was seen differently at home or in an urban setting compared to solitude in natural areas. Interestingly, many of the participants who reflected on the solitude and personal reflection aspects that spending time in nature provided also discussed nature as a social space. This presents a dual perspective of nature as both a place for solitude and social interaction, implying that participants recognized that both of these are important for well-being and were facilitated in natural environments during the pandemic.

It was evident from most participants that the main therapeutic benefits of natural areas during the pandemic were intertwined with the combination of solitude and walking. The uptake of walking during the pandemic will be explored now.

4.8 The Uptake of Walking

The uptake of walking as a means to spend time in nature was a major theme in eight of the Interviews. For these participants, the majority of the values and perceived benefits associated with spending time in nature were experienced through the act of walking within these areas. In all of these eight interviews, the participants began walking or increased the frequency of their walks during the pandemic:

> *"I think the pandemic started with me going out basically every day. I usually take a walk every day nowadays and that started back then. It was just a really surreal but also a very nice feeling going out and there's just nobody out on the street and I really enjoyed that. So I went out. I took a breather, walked, sometimes for an hour, sometimes for two. I don't know."* (Interview 2)

This participant initiated a daily walking routine as a result of the pandemic, without a specific route, for an hour or more. The participant specified that they walked in urban parks, local forests, and through urban streets during this daily walk, as mentioned in other parts of the interview. When asked what they particularly valued about this routine, they answered:

> *"Mainly the fresh air and just walking around with my mind all over the place. I usually listen to music. I don't go out with friends really, I just walk around and take a look at everything around me … that's kind of one of the reasons why I go out for walks is to, you know, get rid of all the school distress from school and stuff. So, it's kind of just an escape from that stuff*." (Interview 2)

Here, the participant elaborates on their underlying motivations and perceived benefits of this walking routine. Firstly, they refer to "*fresh air*," a theme habitually used by participants in their reference to outdoor spaces, which, as discussed previously, implies the refreshing and liberating qualities that natural areas provide. The participant also mentions letting their mind wander and looking at their surroundings, suggesting that this routine provides mental relaxation and sensory engagement, alongside the exercise benefits. The uptake of a walking routine as a coping mechanism for stress and other negative emotions related to school and pandemic-related stressors was similarly echoed by other participants:

> *“Sometimes [during the pandemic] when I was like stressed or maybe when I felt angry or a little bit or agitated … then I would go and take a walk and then I would feel better and I would like calm down a little bit and I think it would like really help me to just like take a walk.”* (Interview 5)

> *“I think when I'm stressed, I do tend to go on like walks more often, either by the lake or in the woods. Yeah, I definitely do that when I'm stressed because it's usually quiet. Unlike the city where it's quite loud … you can really just turn off.”* (Interview 8)

This connection between walking and stress reduction emerged as a particularly strong theme across the interviews. Walking emerged as the best medium by which the participants could immerse themselves in the tranquillity that natural areas offer, and the passivity of this form of movement seemed to enhance that experience. Once again, in Interview 8, we see a comparison with urban areas, and the participant's desire to "*just turn off*," implying a desire to escape from the bustle of such locations, which was associated with the stress and uncertainty of school and the pandemic.

When asked to elaborate of the benefits they experienced from the walking routine, the participant in interview 5 answered:

> “*I think exercise and well-being. But also like when I went to the forest,* it was most of the time really nice, you know, it's *just a very calm atmosphere and I kind of liked that. And it was just, especially when the weather was nice and the sun was shining, it was just really nice. You know, to go for a walk in the forest, just listening to the sounds of the forest. Or then you would also maybe see other people, for example, walking their dog or something like that. And it would just also give you a … little bit of social contact … during the pandemic. That would help my well-being.” (Interview 5)*

This introduces the aspects of exercise and social facilitation that this activity offered to the participants. The opportunity to see other people in the forest, was something that the participant enjoyed, suggesting that the walking routine not only offered an escape from daily stressors, but also nurtured a sense of community and connection, albeit indirectly. The

exercise benefits of a walking routine, were part of what the participant perceived to be the most important aspects of walking in the forest. The whole experience of moving, being and observing in a forest environment is therefore a blend of physical exertion, emotional relief and social engagement for this participant, resulting in maintained well-being and resilience during the pandemic. This acknowledgement of walking's holistic benefits is discussed further by the participant in Interview 8:

> *"I think well-being became more of a big part of it then, because even now if I'm overwhelmed with school stress or anything like that, I'll go for a walk. And that's something that I started during the pandemic, maybe even subconsciously just to deal with it, even though I didn't actually feel stressed because of it or anything. So yeah, I think well-being also became a big part of it then besides, like [the sport element]. Me and my friends discovered that during the pandemic, because there was no other way we could really see each other."* (Interview 8)

Through the phrase, "'*I think well-being also became a big part of it*,'" suggests a subtle transformation in the participants' understanding or appreciation of the benefits of walking. A behaviour that may have begun as a means to exercise or socialize may have evolved into an activity with a primary focus on well-being. It is clear from the participant's previous reference to the quiet and tranquil atmosphere that the forest and lakeside provide, that the location of the walk was important in order to foster these benefits. The participant's acknowledgment of the holistic benefits of this activity, namely stress relief, exercise, social facilitation, and connection to nature, creates a comprehensive picture regarding the reasons behind walking's popularity among so many of the participants. This habit was reflected upon by many participants as having increased in frequency, throughout the pandemic, and has continued as a habit post-pandemic for all 8 of the participants that developed this routine. The participant in Interview 11 reflected that the habit had increased in frequency until it became a daily habit:

> *"I did notice that I like going outside a lot more and I like tended to go on walks with my friends or go outside in the evening and do things like that. And I think like a couple of months after winter …I started going on walks sometimes daily, and my*

step count went up to like 12,000 a day because I was walking that much and spending time in nature." (Interview 11)

This participant also reflected on the improvement in their mental well-being alongside this habit, which gives us an insight into how physical movement, mental well-being, and time spent in natural areas are intricately linked. Interestingly, participants who took part regularly in organized sporting activities transitioned into walking at the start of the pandemic alongside the initial disruption to these activities. This transition also occurred with participants who reported limited or no physical activity prior to the pandemic. This change in behaviour, therefore, seems to be independent of the participants' sporting background and level of fitness.

4.9 Social Facilitation of Natural Areas

As previously mentioned in **4.2**, a theme that emerged in many of the interviews was the opportunity to socialize within natural areas as an alternative to urban locations during the pandemic. The contrast lay in how the beauty and tranquillity of natural areas, as opposed to urban ones, facilitated interactions. This lack of distraction within natural areas, with the given example of no cell phone signal, gives us an insight into how the peace and tranquillity can facilitate understanding the difficulties that this demographic faces within social interactions, namely the habitual use of cell phones that inhibits deep and genuine social interactions:

"I think I value the recreational part and the social part. I think talking is just much better in the woods, as there's just a lack of distraction. You can't really use your phone because the connection is [poor] in the woods, so it improves the way you talk to each other." (Interview 7)

This reference to cell phones by the participant in Interview 7 is interesting, in light of the excessive use of devices emerging in every interview as a negative parameter impacting participants' well-being. This observation, therefore, suggests that, in some cases, natural

areas were used as a buffer zone to mitigate this behaviour and, consequently, enhance well-being. Although other participants did not directly refer to reduced device use in natural areas, the lack of distraction such areas provide in social situations is mentioned by several other participants:

> *"Like if I'm struggling with mental issues I feel when I'm outside in the parks and stuff like that, I kind of just don't think about them because I'm more like concentrating on what's around me and just kind of the wind, the birds and stuff like that relaxes you, and I kind of stop thinking about the bad stuff. And usually when I'm in parks … it's because I'm there with friends. And so that also reminds me of being with friends when I'm in parks … So for example I feel like when I'm with my friends outside in a park, especially if I'm just with one friend, I can really talk with them about one specific thing without getting distracted by other stuff. For example, when I walk through the city with my friends and we're talking, I often get distracted by something else. And then we start talking about the thing that I saw, like in the shopping thing or a library or stuff like that. And then we go in there and then we just start talking about that. But when I'm in the park, we kind of just like talk about our conversation and really stay in that and kind of really focus on each other instead of other stuff."* (Interview 1)

When asked to elaborate on what they meant by "*distracted by other stuff*", the participant in interview 1 mentioned that cell phones were usually a big distraction in social situations, which is diminished in the urban park environments, particularly those by the lakeside in the city of Zurich. This, therefore, concurs with interview 7 regarding reduced device usage in natural areas. The participant in Interview 1 describes the contrast of hanging out with a friend within the city, noting that the visual stimulations of shops remove an element of presence and authenticity from their conversations with friends. The participant, therefore, implies that the tranquillity of urban parks enhances their social connections and facilitates deeper relationships.

Alongside enhancing social connections, tranquillity was also described as simply making urban parks a more enjoyable place to spend time with friends, away from the noise of traffic and the bustle of people:

> *"We went to areas with a bit more play space … and that are little bit closer to nature. It was mostly about not disturbing others, as we were quite loud … It's nice to be in the woods rather than sitting somewhere just beside the street, which is loud with all the cars and it's just not the same."* (Interview 3)

The participant in Interview 3 also discusses the element of having simply more "play space" in natural areas than in urban ones, which they value for spending quality time with friends. This availability of space allows for relaxation without the worry of disturbing people. Despite the participant stating that the decision to socialize within natural areas was primarily driven by not wanting to disturb others, their language suggests that natural areas also enhance the overall quality of time spent with friends. This participant elaborated further on socializing within natural areas:

> *"I think time for myself, and also quality time with friends. It's both of those things. Depending on how I'm feeling, depending on what situation I'm in. So yeah, it could be both. And just having a good time, swimming or hiking, whatever, it's just nice to have a view and something to do outdoors."* (Interview 3)

Here, the participant mentions spending "*quality time with friends*," which is facilitated by having a nice view and activities that are facilitated by natural areas, such as swimming and hiking. Out of the participants that maintained consistent social connections outside of their home throughout the pandemic, all reported these interactions occurring in urban parks, lakeside, and forest locations. This gives interesting insight into the role of nature in facilitating social interactions during the pandemic.

4.10 THE IMPORTANCE OF THE GARDEN

During the pandemic, the importance of personal gardens to participants emerged in several of the interviews. It is important to note that many participants don't have a private garden due to living within an apartment. However, interestingly, two participants who did not increase their visits to local natural areas throughout the pandemic did, in fact, describe their gardens as important spaces for their well-being. This highlights a possible substitution effect where private gardens may have fulfilled the need for connection with nature that others sought in public natural areas. The participant in Interview 1 spent a lot of time in their garden during the pandemic, which was in close proximity to the forest:

> *"So we started using the garden a lot, like my family, to eat outside. So we just ate in the garden, lunch, dinner. And I also used it to study because it was really calming, to listen to music and just have the garden and the green forest and everything. Or when I was just bored and didn't know what to do, I would just sit outside in the garden and listen to music."* (Interview 1)

They described it as "*really calming*", and outlined how it became the place where their family ate meals and where they did a lot of their studying. This demonstrates the multifunctional nature of private gardens during the pandemic. Their garden provided this participant with a place of leisure, relaxation, and tranquillity, while facilitating familial bonding and providing a space where school-work could be completed. Other participants reflected on how having access to a private garden, regardless of how often it was used, prevented them from feeling confined during the pandemic:

> *"We have quite a big garden, so. that's why I don't think I ever really felt confined. I think if we would have lived in a flat then I would understand that feeling. But I felt quite [free], I never felt confined. So yeah. Not even like necessarily spending time in it, but just having it there and having kind of an outside space still that definitely I think helped me … we also have these stairs [leading from the house into the garden] and my mom and I, we used to sit on them during the pandemic. We were outside but still kind of in the house."* (Interview 8)

For the participant in Interview 8, it is clear that the garden serves not only as an aesthetic and recreational space but also provides them with a psychological sense of freedom. Interestingly, this participant also described a significant uptake of walking in local natural areas as a result of the pandemic; however, the garden remained an important space, despite the accessibility of the local forest and lakeside. They describe that sitting on the house steps gives them the opportunity to enjoy being outside in a natural area while still enjoying the safe and familiar environment of being at home. Being easily accessible and private, it appears to have complemented local public natural areas by having a positive effect on well-being for this participant, particularly.

4.11 Environmental Stewardship

The theme related to environmental protection, conservation, and stewardship naturally arose in the interviews due to its relevance to the topic of human-nature interactions. Interestingly, the majority of participants commented that their views on environmental protection were not influenced by the experience of the pandemic, suggesting a consistent outlook across the group. As many of the interviews ventured into the contrasting urban and natural landscape, highlighting many negative traits participants associate with urban environments, the participant in interview 6 went a step further, highlighting their concern with expanding urban developments and their negative impacts on urban landscapes:

> *"In today's society they want to build, build, build. There's a lot more people and so nature is getting more and more value nature because it's getting ruined, for building houses and other buildings."* (Interview 6)

Here, the participant highlights their perception that the value of natural areas is growing due to expanding urban development, with their awareness of the balance between urban and natural areas being heightened. This participant also mentioned that increases in environmental activism throughout the pandemic may be attributed to having more time at home to research current affairs and pressing topics:

> *"During the pandemic you had a lot of time to do your research and I think that played a big role as a lot of other people were busy with like activism, activism in general. So I think a lot of people were online during the pandemic. So there was a lot of more traction online about what are the current affairs of the world. So I guess that influenced it as well."* (Interview 6)

This interesting observation illustrates the potential relationship between online engagement and heightened awareness and involvement with environmental activism during the pandemic. Despite this only being mentioned by one participant, it provides insight into how increased time availability, alongside unlimited information availability through the internet, can foster unique value shifts and behaviours related to environmental stewardship.

4.12 Barriers to Spending Time in Natural Areas

All 12 participants acknowledged that their access to local natural areas was not physically restricted throughout the pandemic. All participants lived within a 1km radius of a forested area, body of water, or urban park. The green elements of the city of Zurich and the surrounding Canton came up frequently in many interviews:

> *"The more trees you have, the more beautiful is the city … Zurich is my favourite city because it still has a lot of green … you can breathe the fresh air."* (Interview 9)

> *"I think Zuirch is a very green and nice city. There are no spots where you can't [access] nature or at least a park."* (Interview 7)

Out of the twelve interviews, it is clear that only two participants did not experience any significant increase in engagement, interaction, or connection with local natural areas at any level throughout the pandemic. Interestingly, there was an emerging theme from some participants involving a divergence between their reported behaviour and how they described their general engagement with natural areas:

> *"I didn't really ever think about nature or like going out in nature or stuff like that. During the pandemic, I was struggling with mental health, so I just kind of locked myself in my room and never really thought about going out in nature and kind of just didn't want to go out. And now I really want to go out in nature again, like studying instead of in my room, studying in the park or studying in an open place with fresh air. And just like, yeah, like use the good weather to go outside instead of just spending it in my room."* (Interview 1)

A revelation from the participant from Interview 1, is the admission of not really thinking about nature, hence making no effort to visit local natural areas. The isolation described could serve as both a physical and metaphorical barrier, encapsulating detachment from the outside world and precluding consideration of the personal benefits of spending time in nature. However, as previously explored, this participant has described the relationship with their private garden as an essential, positive aspect of their pandemic experience. Describing the use of their garden as "*calming*," implying an appreciation for the adjacent forest, and utilizing it as a family social space illustrates a contrasting experience to the detachment described earlier.

The other participant who didn't experience an increase in natural area engagement during the pandemic actually experienced a decrease in venturing outdoors compared to pre-pandemic levels. They described their participation in outdoor sports and visits to the local forest as "*decreasing throughout the pandemic*" (Interview 12), attributing this to academic stress and a feeling of being threatened by the virus outside of their home. This participant described their experience throughout the pandemic as predominantly negative, which they acknowledge could have been related to spending such large amounts of time indoors.

4.13 The Role of Culture and World Views

One participant provided particularly insightful reflections on their Russian cultural heritage and its influence on their interactions with natural areas during the pandemic. This individual constructed a compelling narrative, detailing how the Russian mythology surrounding forests significantly shaped their upbringing and worldviews:

> *"From the beginning I was raised to believe that forest was something good, something that is healthy. So we have the whole Russian mythology surrounding the forest … we have the water spirits and the forest spirits. And then we have, of course the villains, the classical villains that are the same everywhere. The Dragons and the Baba Yaga … that everybody knows. And all this mythology is set in the forest … these were a big part of my childhood … There really isn't any Russian story without the forest.*
>
> *Because [in Russia] there is forest everywhere and it's viewed as good. It has dangerous, but it's mostly a good thing. What I noticed when I also started reading German stories, when I was bit older, like six or seven, was all this brother Grimm stuff and other western European fairy tales. And they're brutal. … The portrayal is that the forest is something scary.*
> *There are bad women [witches] who want to eat you and all this crazy stuff. You should fear the forest. You should never go into the forest. And in Russia it is the other way around. If You have a problem you go into the forest."* (Interview 9)

The participant portrays the forest not merely as a backdrop in Russian lore but as a significant entity within the narrative, playing a predominant role in their childhood stories. They articulate how the narratives surrounding forests are perceived as a force for good within their mythology, with the spirits associated with these areas considered non-threatening. This perspective contrasts starkly with the dangerous implications of forests that permeate Western European stories, exemplified by the works of the Brothers Grimm.

Their upbringing, intertwined with this cultural perception of forests, played a pivotal role in shaping their worldview surrounding nature. Positive associations with forest areas are

replete with themes of health and inspiration. "*If you have a problem, you go into the forest*," emphasizes how forests are viewed as sanctuaries and refuges in their culture, rather than spaces of fear and danger.

Such a unique and nuanced cultural lens—pertaining to attitudes towards natural areas—was not reflected in other participants' responses. The participant continues to detail how the pandemic, creating vast expanses of time, encouraged further ventures into these areas—something mounting school pressures throughout their teenage years had previously inhibited. This inclination to immerse more in the forest during the pandemic was influenced by their cultural background and associated worldviews.

4.14 Reflections on Age and Development with Natural Area Connectedness

A recurring theme across all interviews was the interplay between the participants' age and development and the unique circumstances of the pandemic, exploring how these factors influenced the participants' relationships with natural areas:

> *"Like the more you grow up, the more you learn about the environment, or how you should appreciate nature."* (Interview 6)

One participant, stated that:

> *"I don't actively seek the forest when I'm stressed. It's just I think it relieves stress when I'm there. But if I'm stressed, I don't go."* (Interview 7)

This statement might be contextualized by this individual's overall positive experience of the pandemic. The minimal disruption to this participant's lifestyle could potentially mitigate the stressors that led other participants to interact differently with natural areas. Nonetheless, they described an increased level of engagement and appreciation of nature during the pandemic, attributing this more to age and experience than directly to the pandemic scenario:

> *"I think I started to value nature the more during and after the pandemic. Before [the pandemic] I often found it annoying, but I think I came to appreciate it … I don't know if that's linked to the pandemic or just getting older."* (Interview 7)

This reflection by the participant demonstrates their awareness of their evolving values and attitudes as they mature. It is evident that they recognize their maturation over the three-year period between the start of the pandemic and the time of the interview. By stating, "*I often found it annoying*" regarding their pre-pandemic perspective, they underscore this maturation, transitioning from a more childish and disconnected worldview to a state of reflection and appreciation for nature. They further expound on their belief that the pandemic had a limited effect on their appreciation and interaction with natural areas, attributing this to their lack of experience with social isolation, which they identify as a principal trigger for others' negative experiences:

> *"A lot of people talked about nature and how you lack the connection to nature during the pandemic … I didn't really experience isolation during the pandemic, so I can't link it to that."* (Interview 7)

In the statement "*I can't link it to that*," the participant refers to their increasing engagement with nature. They attribute any changes in behaviour more to age and development than to the pandemic scenario, citing a lack of experience with social isolation. However, they may have underestimated the pandemic's effects on their development. This is suggested by their implication that the increased desire to spend time outdoors was tied to feelings of confinement and boredom:

> *"I started going outside more just because there wasn't anything else to do. Being all day inside … after a few weeks I just didn't want to do it anymore."* (Interview 7)

Here, the participant suggested that the initial lockdown scenario prompted them to venture outside more, possibly underestimating the impact of the pandemic on their behaviour and values. This notion—that a combination of age and pandemic experiences brought about the observed changes in relationships to natural areas—is echoed by the participant in Interview 11:

> *"When I was around 14, I didn't really go outside that much, and that might not have been the best idea. And I didn't think of nature as a place like where I could be calm and peaceful. And then I actually think it started mid pandemic where I started going out more on walks because we were inside the entire time so. So I think the pandemic actually caused me to want to be outside a lot more."* (Interview 11)

In this instance, similar to the participant in Interview 7, the interviewee reflects on their younger years when the personal benefits that nature could offer were not a consideration for them. However, as they aged and experienced the pandemic, they were encouraged to venture outside more. They consider the pandemic as the predominant factor in this shift in values, but by reflecting on how their values differed during their early teenage years, they also acknowledge the role of maturity and development in these changes.

This reflection on the impact of age and development on behavioural changes throughout the pandemic was not unique to this participant. The individual in Interview 3 also reflected on their changing behaviour, attributing it directly to their age:

> *"Well, I was a teenager [at the start of the pandemic]. I was 16. So, I Started drinking and having like parties. And in summer especially being a lot outside, just not doing anything in particular." (*Interview 3)

The participant in Interview 3, describes their age and the behaviours associated with being a teenager, as a contributing factor to their engagement with natural areas at the beginning of the pandemic. This statement however highlights a shift in outdoor activities more associated with socializing and recreation rather than a specific connection to nature itself, with partying and drinking being undertaken in more secluded forest areas where they would not be disturbed or disturb others. This participant however elaborates on the role that age has played on their interactions with natural areas:

> *"What I think I realized is just the time being alone in nature. I appreciate that much more the older I get. If I'm with people, it's just the nature part, just steps like in the background … it's way better to be outside and like have good weather then just spending all day inside and doing something where you don't get to move and don't have the fresh air. And so yeah, the thing is just realizing that being alone in nature is quite refreshing.*" (Interview 3)

This participant provides a deeper reflection on how maturity has affected how they perceive the benefits of spending time in natural areas. Despite this participant also reflecting on how the pandemic influenced their use of natural areas, particularly as a social and calming space, their reflection on maturity emphasises that their natural development has played a large role in the perceived changes in values, alongside the pandemic. Interestingly, this participant further reflects that their changes in values in regards to nature, may not have happened alone, organically with age, and the pandemic was an important catalyst for this development. This sentiment is sophisticatedly described by the participant in interview 6:

> *"I think with the pandemic, once you lose something, you realize how much worth that you actually had. I think that played a role. Like I took [nature] for granted as a child because I was ignorant and I didn't notice it as well. So I think [this appreciation developed with age] and the pandemic just amplified that."* (Interview 6)

The participant eloquently describes how the pandemic 'amplified' the changes in values related to maturity. This amplification is due to the effect that losing something has on an individual's level of appreciation for that 'thing.' In the case of the pandemic, the feelings of confinement experienced in the early stages led the participant to reflect on their own appreciation and values related to nature.

5 DISCUSSION

This thesis has embarked on trying to understand how the disruptive backdrop of the COVID-19 pandemic has influenced adolescents' relationship and interactions with natural areas. Central to this exploration was the primary research question 'How has the COVID-19 pandemic influenced adolescents' relational values and interactions with natural areas, and if these changes are present, how do they manifest as indications of Urgent Biophilia?'. To address this, two sub-questions aimed at discerning the shifts in engagement with natural areas and the changing of adolescents' relational values towards nature during the pandemic were explored. This discussion will therefore provide an analysis of the multifaceted impacts surrounding the shifts in behaviour and values that the participants experienced, as well as examining these findings alongside the broader literature surrounding COVID-19, Relational Values and Urgent Biophilia.

The qualitative analysis of the twelve interviews revealed a heightened appreciation for and interaction with natural areas among ten of the participants, elucidating the evident shifts in relationships with local natural spaces stemming from the lifestyle disruptions imposed by the pandemic. A thorough exploration of salient themes emerges from the participants' experiences, namely illustrating nature as an escape, a therapeutic refuge, a space for walking and reflection and a facilitator of social interactions. Each theme will be examined in the subsequent sections, with a thorough examination of their implications in relation to the studies overarching research questions.

5.1 ADOLESCENTS' WELL-BEING DURING COVID-19

In order to provide a context for the shifts in values and behaviours that will be explored in the subsequent sections, a discussion of how the crisis scenario of the pandemic impacted the participants well-being is necessary. As portrayed in the results, it is apparent the majority of participants had a relatively mixed experience of the pandemic, in regards to the effect on their well-being. However, we can see some distinct similarities across all the participants

experiences, that concurs with the abundance of literature in the field on COVID-19 and adolescents mental health. The predominant theme was a large disruption of routine, and abundance of available time, and the excessive device use that this facilitated across all twelve of the participants. It is clear that, especially during the initial stages of the pandemic, that the cancellation of scheduled activities that formed the bedrock of the participants day to day routine, removed structure and predictability in everyday life. This routine disruption and the abundant free time that this resulted in, was always the first aspect of the pandemic that the participants mentioned, when discussing how it impacted them personally. Furthermore, all mentioned effects on their well-being appeared to be facilitated through this basic lack of schedule, and the resulting loss of balance. The participants narratives are substantiated by Brooks et al (2020), who highlights that maintaining a balanced routine as composing the foundational pillars for mental well-being, especially within this demographic. Brooks et al. explains that through removing structure, predictability and security within adolescents' day to day routines, made the pandemic particularly detrimental to the well-being of this demographic.

A constant theme across many of the participants experiences was an undertone of boredom, frustration and in some cases social isolation. These themes are consistent with the literature, which delves into the factors behind rising depression and anxiety across this demographic during the pandemic (Xie et al., 2020; Loades et al., 2020; Brooks et al., 2020). A major theme that all participants discussed as impacting their mental well-being, was their drastically increased time spent on electronic devices. Even participants whose pandemic experience was described as mild to positive, spoke about this issue as having had a negative impact on their well-being, leading to disrupted sleep schedules, less physical movement and disconnected social lives. This trend of excessive device usage and the resulting well-being impacts is corroborated by an abundance of literature linking increased device usage with negative well-being parameters (Ott et al 2020; Tang et al 2021; Cellini et al 2020; Dunton et al 2020). Interestingly, an abundance of literature highlighting the damaging aspects of excessive device usage was released after the onset of the pandemic, implying a cause effect relationship between the crisis scenario and device addiction.

The changing academic environment and associated stresses, exacerbated by fluctuating restrictions and online learning phases, amplified the already present academic pressures. Lee (2020) describes such pressures as potential escalators of mental health challenges in adolescents. This reflection is crucial in understanding the potential impetus behind the participants' increased engagement with natural areas as a coping mechanism.

The participants responses therefore point to an element of disruption to their everyday lives as a direct result of the pandemic and the resulting restrictions, which ultimately has negative implications for personal well-being. This identification of disruption, therefore aligns with Mackinnon et al.'s (2022) adoption of the Urgent Biophilia concept for COVID-19 crisis scenario, who recognizes the pandemic's disruptive nature that parallels the characteristics of natural disasters, that Tidball (2012) uses in his original framework. Moving forward, we can therefore discuss whether these stressors and disruptions led the participants to consciously seek out natural areas to bolster their resilience in this crisis.

5.2 Nature's Refuge: Changing Perceptions of Space in a Crisis

As highlighted in the results, a significant theme in participants' responses was the desire to escape the confinements of the home environment and the stresses of daily life. Several terms including "*fresh air*," "*refreshing*," and reference to having an abundance of space arose throughout many of the participants narratives surrounding their experiences in natural areas. The emphasis on "*fresh air*" throughout the interviews potentially signifies a contrast to the participants' home environments, highlighting the freedom local natural areas offered both physically and figuratively. This is in alignment with research on the restorative effects of nature (Kaplan 1995; Ulrich et al 1991). Such descriptions suggest that natural areas served as a form of sanctuary, both physically and emotionally, for many participants during the pandemic.

Interestingly, while homes were associated with relaxation and rejuvenation before the pandemic, many participants described how they became increasingly seen as confining spaces, due to the increasing amounts of time they spent there, alongside their siblings and parents. This could be attributed to the pandemic's effect on participants' sense of space,

especially with academic responsibilities shifting into the home, alongside more time being spent indoors due to cancelled extra-curricular activities and social events. This alteration in the sense of space can be understood as a result of the intertwining of different life domains—academic, familial, and personal—within the same physical environment, leading to a transformed perception and experience of what was once a space primarily associated with relaxation and rejuvenation. Alongside this, access to other spaces that participants may have used for leisure time, such as sport facilities, cafes and friends' houses, were likewise severely restricted. This therefore may have created a void, in which local parks, gardens and forest appear to have filled, providing a leisure space with a rejuvenating quality. Tidball and Kransky (2013) note that a strong sense of place bolsters resilience at both personal and community levels. The emphasis on the relational values of well-being and beauty in participants' descriptions of natural areas implies a profound sense of place associated with these locales, a notion supported by Morse et al., (2020) and echoed by Scannell and Gifford (2010), who ascribe formative roles in developing individuals' sense of place to elements like trees and the colour green.

This shift in values and interactions is accentuated by participants' expressed discomfort in urban settings during the pandemic, reflecting the well-documented well-being benefits associated with greener environments (Alcock et al., 2014). While participants didn't explicitly associate COVID-19 risks with urban areas, the allure of these spaces evidently diminished, possibly due to lockdown measures, reduced social interactions, and a heightened awareness of personal space. This, combined with the suspension of many urban activities, may have revealed deeper biophilic inclinations, a concept relatable to Gullone's (2000) "Nature Deficit Disorder," suggesting that rapid urbanization is creating environments that clash with our evolutionary preferences.

Tidball and Kransky (2013), describe resilience at both a personal and community level to be significantly bolstered by a strong sense of place. The participants descriptions of local forests, parks and gardens as a rejuvenating place of escape, with particular emphasis on the relational values well-being and beauty, imply a strong sense of place associated with these areas. This observation is substantiated by Morse et al., (2020) who likewise identified an increase in importance of relational values associated with fostering a strong sense of place during the pandemic. These specific relational values will be explored later in **5.3**. This idea is

further supported by participants habitual reference to the colour green, trees and water bodies, with Scannell and Gifford (2010) describing trees and the colour green as formative in fostering an individual's sense of place. The participants negative references to urban environments within the pandemic context, implies their intrinsic attraction to nature became more pronounced, thus amplifying feelings of unease associated with urban landscapes.

These discussed changes in the perception of place and the amplified allure of specific natural elements, can be regarded as strong indicators of Urgent Biophilia amongst the participants. Furthermore, the increasing importance of specific relational values, formative in fostering a strong sense of place, was likely one of the manifestations of Urgent Biophilia across the participants.

5.3 Walking and Well-being Amidst a Pandemic

The interviews unveiled two notable findings: a distinct rise in walking within natural environments and the consequent sense of well-being these natural surroundings evoked. These observations are deeply interconnected, with walking being the foremost method by which participants harnessed the well-being benefits of nature. Berman et al. (2012) support this observation, highlighting improved mood and memory performance resulting from walks in natural areas. The establishment of a regular walking routine, which many participants reported as having increased throughout and sustained post-pandemic, underscores the dose-response relationship identified by White et al. (2019) between time spent in nature and mental well-being benefits. This transitioning of this habit into a daily activity for many of the participants, was based potentially based on a personal recognition of this doe response relationship.

The enormous benefits that the exercise element of walking has both physically and mentally, has to be acknowledged as a major factor behind the benefits to their well-being benefits experienced by the participants. This therefore poses the question whether the participants' inherent motivation to adopt a regular walking routine was motivated by the pursuit of exercise or by immersion in nature. The participants' responses, characterized by descriptions

focused on emotions and feelings connected to their surroundings, seem to answer this, implying that the walking experience was profoundly intertwined with nature. While the exercise aspect was a welcome by-product, it was not the central motive, evidenced by the participants' lack of interest in the distance walked and their instances of pausing for reflection in natural areas. Therefore, despite exercise being inherently tied to the therapeutic aspects experienced, the importance of the surroundings on the experience, suggests that walking was indeed a manifestation of Urgent Biophilia. Many of the participants that began a walking routine, did so as both a solitary and sociable activity. It is therefore also likely that the perceived benefits from walking in nature, were also linked to the well-being benefits associated with good social interactions, and the meditative, rejuvenating aspects that solitude can provide. These values will be explored in **5.4** and **5.5**.

The uptake of walking, over other outdoor sports like cycling or running, mirrors the popularity of more passive forms of movement and activity that Morse et al. (2020) highlighted in their study on shifting relational values during the pandemic. Morse et al. also identified walking, alongside bird watching, as increasing significantly in the early stages of the pandemic, with no increases in more intense activity forms. Although living location and demographic plays a great role in such behaviours, the concurrence between both studies findings, points a finger towards activities that foster a deeper connection with nature, more focused on values surrounding beauty, tranquillity and well-being. This trend also suggests that activities that allow individuals to immerse themselves for longer periods of time in natural areas, gained popularity during the pandemic. Walking allowed the participants to experience the therapeutic benefits of natural areas for longer periods of time, in comparison to running or cycling, where movement through an area is considerably quicker and at a higher intensity. Furthermore, the slow nature of walking allowed the participants to spend longer periods of time away from the home, which shows that the act of walking was intertwined with the desire of using natural areas as a form of escape.

Participants displayed a clear preference for the location of their walking routine, opting for forests, waterside, and parks over urban settings, mirroring their reported 'unease' with urban areas. This inclination closely aligns with Mackinnon et al. (2022), who explored Urgent Biophilic behaviour in Wellington, New Zealand, finding a significant increase in the use of city green areas for walking and cycling during lockdown periods. Their mixed-method approach

revealed a preference for urban green spaces as a primary coping strategy during heightened stress, a finding also reflected by Venter et al. (2020) around Oslo, Norway. Through utilising qualitative interviews, this study was able to delve deeper into the psychological dimensions of participants' preferences and experiences. Such an understanding has the potential to complement such quantitative data, thus increasing our understanding of interactions with natural areas during such stressful times. The comprehensive insights gained here elucidate how the combination of walking and sensory experiences in natural areas can create holistic well-being experiences, extending the discussion beyond the quantifiable and questionnaire-based data presented by Mackinnon et al. (2022)

5.4 A Therapeutic Respite and Solitude

The turn towards serene, solitary activities in nature suggests participants sought refuge and restoration from the tumultuous changes and uncertainties brought about by the pandemic. The described well-being benefits were not just ancillary; they were identified as the primary motivation for these activities. Many participants described moments of solace in local natural areas, particularly near water, emphasizing the therapeutic effects they experienced.

Bodies of water consistently emerged as therapeutic landscapes in the interviews. Some of the participants recalled experiences of sitting next to local lakes and rivers during difficult periods, and how these experiences benefited their well-being. Gullone (2000) provides an evolutionary perspective to this inclination, suggesting that bodies of water symbolize resource abundance. This natural attraction aligns seamlessly with Wilson's (1984) concept of biophilia. Moreover, participants frequently mentioned the captivating visual appeal of forests and the comfort evoked by the colour green and the visual stimulation of the forest. These sentiments find support in evolutionary psychology, where the colour green is associated with positive emotions and cognitive functions (Kaplan, 2001). Additionally, the sense of security and appreciation elicited by lush forests, especially those with towering canopies, underscores the idea of perceived safety and resource availability (Gullone, 2000) – both hallmarks of biophilic tendencies. It is clear that, the restorative effects of nature, particularly a decrease in cortisol production and the replenishing of attentional resources

(Kaplan, 1995), has been experienced and consciously sought out by many of the participants. This emphasises how having access to local green spaces is an important part of personal and community resilience during crises scenarios (Morse et al., 2020; Tidball and Kransky, 2013)

Despite the pandemic induced social isolation being difficult for some participants, paradoxically, they valued natural areas as a means to enjoy time alone, and the calming and restorative benefits this offered. Furthermore, some participants reflected that this opportunity for solitude that the pandemic offered, taught them about the personal benefit that can be experienced from time alone in nature. One participant, articulated this well, by describing their activities in natural areas being predominantly social based until during the pandemic, where they discovered the importance of time spent alone for their personal well-being. This therefore portrays the pandemic as an important catalyst for shifting relational values within this demographic, from recreational and social based, to deeper values surrounding nurture and well-being.

This observation is also substantiated in the literature, with a study on the relationship between the experience of solitude and access to nature in the COVID-19 context, concluding that the experience of solitude is significantly enriched when in natural areas (Samangooei et al 2023). Aligning with the descriptions of solitude that the participants offered, Samangooei et al. highlighted that time spent alone surrounded by nature, facilitated the positive experiences of rest, rejuvenation, stress relief and Reflective thought. These positive experiences are a consequence of the biophilic mechanisms intertwined in our evolutionary psychology, as previously discussed.

The observed shifts in the relational values among participants in this study closely resonate with the findings of Morse et al. (2020), who identified an intensification in values associated with nurture, including mental well-being, beauty, familiarity, and identity. These values manifest prominently within the narratives and descriptions provided by the participants in this thesis, drawing a parallel between the findings of this study and those of Morse et al. (2020). The relational value of ‘beauty’ was present in the participants' references to their admiration and appreciation for the aesthetic and sensory appeal of forest areas and water bodies. This was evident when they detailed their moments walking, sitting, or socializing around such spaces. Likewise, the value of ‘familiarity’ was evident in the participants' descriptions, with reference to the feelings of comfort and recognition they experienced

while spending time in frequented or favourite locations. This was present in the participants' descriptions of their preferred local natural settings, which highlighted a sense of comfort and belonging associated with these areas. The reflection of these values within the participants narratives, not only concur with the findings of Morse et al. but also extend our understanding of how relational values are conceptualized and experienced within natural settings during crisis scenarios, such as a pandemic.

5.5 Nature as a Social Space

Intriguingly, all participants who recounted positive experiences of solitude during the pandemic also conveyed a deep value for nature as a social space. When delving into discussions about natural areas serving as social spaces, the tranquillity inherent in such areas was emphasized as being pivotal in fostering deep and meaningful social connections—connections which would likely be disrupted and comparatively shallow within bustling urban environments. The reduction in electronic device usage within natural areas, was described by participants as being particularly facilitative of good social interactions.

The transformation of nature into a pivotal social space could likely be attributed to shifts in place perception, as previously discussed. Since all participants were 15 and 16 years old at the onset of the pandemic, they were at an age where the prominence of social activities, particularly group gatherings and parties, was increasingly evident—a detail explicitly referenced by several participants. The beginning of the pandemic coincided with this stage in their development, which naturally discouraged social gatherings in typical urban locations. Alongside this, home environments started being perceived as feeling restrictive and confining by many participants, due to the increasing amounts of time they had to spend in this location, often alongside parents and siblings. This convergence of factors seemingly created a void that natural areas could fill, accommodating the participants' requirements for social and leisure spaces. This interpretation gains prominence as every participant who reported frequent, quality social connections during the pandemic unanimously highlighted local natural areas as their principal meeting locations; especially in the earlier stages of the pandemic, when the perceived risk of COVID-19 was high. Walking with friends in natural

areas was also mentioned by many of the participants as a good social activity option during this period.

The initial utilitarian value ascribed to natural areas appears to have been slowly replaced with a deeper appreciation of such areas, as they discovered through experience the elevated quality and depth of interactions that natural areas facilitated. This increase in interaction quality was described by the participants as being attributed to the tranquillity of such areas, which led to distractions being minimized, allowing for deeper, authentic conversations. Additionally, the well-documented wellness benefits of nature, such as stress reduction (Kaplan, 1995; Ulrich et al., 1991), were clearly mirrored in the way participants interacted with their friends. One of these mentioned distractions, that lessened in natural areas, was the use of electronic devices. This will be explored in section **5.6.**

It is likely that the social facilitation of natural areas, increased the participants resilience, with social isolation, during the pandemic, being identified as a major cause of poor mental-well-being parameters among this demographic (Xie et al., 2020). It is therefore clear that participants increasingly valued the social facilitation of natural areas throughout the pandemic.

5.6 NATURES AS A DIGITAL IMPULSE INHIBITION

As previously discussed, excessive device use, has been substantiated in the literature as being negative for adolescents' well-being (Elhai et al 2017; Lee et al., 2016). The reference to natural areas as a kind of buffer zone for reduced device usage by the participants, is therefore very interesting, particularly in light of the literature that delves into this relationship, previously explored in **2.10**. Minor et al. (2023) identified a digital impulse inhibition, that longer periods of nature exposure can trigger. Furthermore, they speculate that some of the well-being benefits experienced from time in natural areas, is likely attributed to lower levels of device usage (Minor et al., 2023). This digital impulse inhibition that natural areas facilitate, is clearly demonstrated in this studies participant within social settings, and is therefore clearly an aspect of natural areas that they particularly valued

throughout the pandemic. Many of the participants described using their phone to listen to music when alone in natural areas. Further study would be necessary in order to identify whether this digital impulse inhibition, experienced when in group settings, transferred to time spent alone.

5.7 The Role of Age and Development in Changing Relationships with Nature

Many participants offered nuanced reflections and perspectives on the impact of their life stage and developmental maturity throughout the pandemic, and to what extent this impacted their changing relationship with nature. These reflections illuminate the extent to which the pandemic served as a catalyst for altering interactions with natural areas in contrast to the influence of their evolving maturity. As Hughes et al. (2019) identified an increase in nature connectivity into adulthood, from 15–16-year-old low point, it has to be discussed if the changing interactions with nature would have organically occurred regardless of the pandemic. One participant, who described their pandemic experience as predominantly positive, attributed their increasing engagement and appreciation of natural areas to their maturation over the time frame. However, their dismissal of the pandemic as a catalyst for this change is, to a degree, contradicted, by their depiction of feeling bored and constrained within their home, and the excessive utilisation of devices that this resulted in. These feelings were outlined by the participant as motivating a greater inclination to venture outdoors. Therefore, it is plausible that despite their initial dismissal of the pandemics influence, it ultimately had an impact on their depicted behaviour. This participant attributes their positive pandemic experiences to their maintained good network of social contacts throughout this period. Loades et al. (2020), identified physical activity and time spent outdoors as important strategies for determining adolescents' mental well-being resilience throughout this time period, therefore it is also likely that this individual increasing nature engagement played a role in their positive lived experience during this period.

The self-reported lower engagement with nature during the mid-teenage years by some participants coincides with existing research by Hughes et al. (2019), suggesting a universal

developmental trend of fluctuating nature connectedness that generally increases into adulthood. However, the sharp contrast reported by participants between their pre-pandemic disinterest and their evolved appreciation and engagement with nature during and after the pandemic implies a possibility of the pandemic serving as a catalyst in this developmental trajectory. The previously discussed themes, relating to participants changing values and behaviours in regards to natural areas, makes a strong case for the argument that the pandemic did in fact have an amplifying effect on their development, thus once again supporting the notion of Urgent Biophilia being experienced by the participants.

As previously mentioned, academic stress played a large role in the participants description of stress during the pandemic, and therefore we must consider its interplay with participants' interactions with natural environments. Venter et al. (2021), highlighted that adolescents were probably disproportionately affected by fluctuations in institutional regulations during the pandemic, attributed to changes from virtual to in person schooling, with this change influencing their lives significantly. Participant's narratives implied that academic stress intensified the uncertainties and disruptions of the pandemic, and therefore this combination of stressors, likely influenced participants' inclination to seek refuge in natural settings. Hughes et al. (2019) showed a dip in human-nature connectedness around the age of 15-16, which typically rebounds as one progresses into adulthood. This developmental trajectory, compounded by the substantial academic pressures associated with impending Matura exams, and further amplified by the multifaceted stressors inherent to the pandemic, conceivably contributed to the observed alterations in interactions with natural areas.

Thus, the interaction between developmental stages, institutional regulations and academic pressures and the unprecedented stresses of the pandemic creates a multifaceted framework to understand the varying levels of nature connectedness among adolescents.

5.8 Cultural Narratives and Nature Interaction

Several participants depicted notably nuanced and culturally enriched world views, profoundly influencing their evolving interactions with nature throughout the pandemic. Both Xie et al. (2020) and Haas et al. (2021) delineated how individuals' responses to COVID-19—and the consequent impact on well-being—were intimately tied to the varied world views inherent to different cultures. As most of the participants had grown up in Switzerland, the main differences in world views came from their parents' cultural heritage, and how this impacted their upbringing. Despite this being an area that wasn't deeply explored in the interviews, one participant's unique view of the forest, influenced by their parents' Russian heritage, seemed to have a marked impact on their interactions with nature during the pandemic.

This participant's Russian heritage, which is marked by a profound reverence for forests depicted in folklore as spaces of healing, sanctuary, and solace, stands in contrast to Western European folklores, such as those of the Brothers Grimm, where forests are often associated with danger. While this participant described their pandemic experience as predominantly positive, characterized by increased time spent walking in the forest, they also experienced well-being impacts related to routine disruption—a characteristic shared across all participants' experiences. Their increased forest visitation was attributed to having more time available during the pandemic, especially during periods of remote learning. However, it is clear that this participant's worldviews and cultural heritage played a pivotal role in shaping their perceptions and interactions with natural environments, directly impacting their decision to spend more time in the forest during this crisis period. Even though we must approach the perspectives of a single participant with caution, this narrative offers valuable insight into how cultural heritage and worldviews can influence human-nature interactions and contribute to overall resilience in crisis scenarios.

5.9 Exploring Disconnections from Nature

Interestingly, the experiences of one participant, whose interaction with nature decreased from pre-pandemic levels, could be interpreted as indicative of lower resilience levels to the stressors inherent in the crisis scenario. Although no physical barriers prevented this participant from exploring natural areas, they described figurative barriers, such as academic stress and uncertainties surrounding the threat of COVID-19. These stressors discouraged the participant from venturing outdoors, which they did frequently prior to the pandemic.

As the sole participant to report a decrease in engagement with natural areas from the beginning to the end of the pandemic, exploring the reasons behind this participant's predominantly negative experience holds academic interest. It is plausible that the reduction in physical activity, crucial for maintaining physical and mental well-being, contributed to this participant's adverse experience (Loades et al., 2020). Exhibiting the lowest levels of nature exposure and the poorest mental well-being parameters, this participant's experience resonates with the correlation identified by Tomasso et al. (2021) in four US metropolitan areas during the pandemic.

Interestingly, this participant, residing in an urban sector of Zurich with limited green space views from their balcony, echoed Tomasso et al.'s findings—indicating that indirect nature exposure can significantly impact well-being. Given Zurich's green urban environment, most city-dwelling participants reported living near forests, parks, or the lake, with green elements visible from their residences. The exception was this participant, who observed no green elements from their window or balcony. Consistent with Tomasso et al.'s findings, this relative lack of nature exposure correlated with poorer well-being parameters compared to other participants. Eight participants resided within Zurich city. Although many expressed a degree of discomfort associated with urban areas during the pandemic, seven of these participants reported having good access to natural areas and demonstrated increased engagement with these spaces throughout the period. This observation corroborates Zurich's reputation as a biophilic city (Beatley and Newman, 2013). Its abundant green spaces and convenient access to nature appears to have bolstered the well-being and resilience of these participants throughout the pandemic (Miliken et al., 2023; Alcock et al., 2014). The simultaneous

existence of urban discomfort and benefit from nature access might highlight the indispensable role of natural elements in urban settings during adverse circumstances.

While the unique experience of this participant provides valuable insights that can be aligned with broader research findings, it is important to recognize the limitations associated with being able to draw broader conclusions from a single participants narrative. An individual's personal experience can be significantly influenced by unique contextual factors, including life experience and psychological predispositions. Because of this, while providing an interesting foundation for discussion, a cautious approach must be taken here in generalizing these findings.

5.10 Private Green Spaces: A Hidden Interaction

Two participants described private gardens as important green spaces throughout the pandemic. One of these participants, describes struggling with poor mental well-being throughout the pandemic, which impacted their motivation to venture away from their home environment. Because of this, it is likely that a private garden provided green space that was both accessible and familiar, of a less intimidating nature than local forests and parks. This participants contradiction, between stating they have no interaction with nature, yet utilizing their garden daily as an important green space shows how interactions with nature can often be subtle and unintentional. This participant emphasises how the green elements of their garden gave them a sense of calmness, and facilitated relaxation during the pandemic, which portrays gardens as therapeutic landscapes, alongside forest areas and water bodies.

Interestingly, only one other participant highlighted their garden as an important space in their pandemic experience. In contrast to the other participant, this individual also engaged with natural areas outside their home environment, maintaining a daily walking routine in the forest and along local water bodies. Despite their frequent visitations of natural areas outside the home, their narrative portrays their garden as remaining an integral part of their day-to-day life, as a relaying, rejuvenating space where family members could gather and interact. Based on the narratives of these two participants, the garden could be viewed as a transitional

area that bridged the domestic home environment with the refreshing, tranquil outdoors. This therefore made it very accessible, and thus the participants could passively reap the benefits from such a space. Despite other participants not having or access to a private garden, attributed to living in apartment buildings, the balcony was mentioned by some as being an important space throughout the pandemic. These insights suggest that having access to a private green location, whether in the form of a garden or a balcony, alleviated a sense of confinement that the pandemic imposed, and may have been important for contributing to the participants resilience to pandemic stressors.

6 CONCLUSION

This research has explored the nuanced impacts of the COVID-19 pandemic on adolescents' relational values and interactions with natural areas, delving into the manifested indications of Urgent Biophilia. The commonality of themes across the participants' experiences suggests that an Urgent Biophilic behavioural response occurred in the majority of the participants, as a response to the negative well-being effects that the pandemic directly and indirectly caused. This response, indicative of urgent biophilia, is reflected in shifting relational values and behavioural interactions with local natural areas.

Participants' experiences in natural areas were closely tied to their desire for escapism and solace from everyday challenges, which were often intensified by the pandemic. It is clear that heightened recognition of the therapeutic properties of spending time in natural areas motivated their conscious effort to increasingly engage with local nature. The participants' narratives surrounding the times they spent in natural areas to cope with pandemic-associated stressors illustrate the increasing recognition of forests, water bodies, and personal gardens as therapeutic landscapes, motivating them to consciously spend time in such areas. Natural areas were increasingly valued as providing a place of relaxation and rejuvenation, as the home environment became increasingly confining and urban spaces became restricted. A theme regarding increasing unease with urban spaces emerged in the participants' descriptions, with biophilic preferences becoming a conscious drive to spend time in natural areas. Themes relating to relational values important in fostering a strong sense of place, namely beauty, familiarity, and well-being, emerged in the participants' descriptions of natural areas. The pandemic influenced a shift towards relational values related to nurture, showing an evolution in the participants' perceptions and interactions with natural areas, from purely recreational spaces to nurturing, rejuvenating spaces.

Participants valuing the therapeutic effect of natural areas was intertwined with experiencing solitude in these serene environments. At the same time, many participants described such areas as formative social spaces, facilitating higher quality social interactions, attributed to a lack of distractions and overall serenity. The participants particularly valued the decrease in electronic device usage that natural areas facilitated within a group environment. The

widespread adoption of a walking routine was the most notable adaptation in interactions with natural areas by the participants. Primarily driven by experiencing the well-being benefits of natural area immersion, walking emerged as the predominant medium utilized by participants to explore and spend time in local natural environments. This prevalent modification in behaviour was deeply intertwined with, and fuelled by, the values that had gained significance for participants throughout the pandemic. Given the ubiquity of this behavioural alteration across participant experiences, it becomes evident that the adoption of a walking routine represents the most salient manifestation of Urgent Biophilia observed within the study.

The implications of this thesis suggest that crisis scenarios, such as the COVID-19 pandemic, can intensify biophilic tendencies in adolescents—a demographic generally characterized by lower levels of human-nature connectedness. In essence, it provides an overview regarding how adverse circumstances can amplify the intrinsic human inclination to seek connections with nature.

6.1 LIMITATIONS

As part of good academic practice, and to ensure the results are presented with the utmost transparency, the studies limitations need to be acknowledged and critically assessed. Such limitations can impact the depth and comprehension of the study's findings (Ochieng 2009).

While this research provides valuable insights into how adolescents relationship with natural areas is influenced in crisis scenarios, it is important to recognize these limitations when evaluating its contributions to the field, and guiding future research into this area.

6.1.1 Methods

Firstly, the limitations involving the methodology need addressing. The participant sample was recruited from KZN using an interactive poster, which provided some basic information about the interview topic and contained a QR code for interested students. Many students

knew me either directly or indirectly, and the ones who registered their interest may not represent a typical student at the school, possibly skewing the participant pool.

The interviews were advertised in English, potentially dissuading students not confident in the language. The choice of English could have inhibited some participants from expressing themselves as naturally and sophisticatedly as they might have in German. Although participants had the option to answer in German, all chose to conduct the interviews strictly in English. The justification for choosing English as the interview language has been set out in **3.3**.

Attempts were made to achieve linguistic and cultural balance within the participant pool by recruiting from Hull's International School, but these efforts were unsuccessful. Consequently, the entire participant pool was from KZN, with gymnasium students representing the top 20% of academic ability within Switzerland's education system (Hofer et al., 2017). This selectivity means that the participants might not typically represent the entire demographic, and the study area of Canton Zurich may not depict adolescents from different areas of Switzerland accurately.

The focus and thematic questions of the interview may have inclined participants to respond more favourably toward nature than their lived reality entailed. Due to the current relevance of environmental protection in the media, participants might have felt pressured into exaggerating the role of nature in their lives.

The combination of inductive and deductive coding during the coding process, while beneficial, can also be a potential source of bias. Themes derived from early interviews can influence the coding of later ones, and codes emerging later in the process can be applied differently to earlier interviews upon revisiting them. However, the methodology used in this study also entailed some notable strengths. Namely the semi-structured interview strategy that employed both deductive and inductive questioning. This allowed themes that naturally arose in the interviews to be pursued spontaneously, without being bound rigidly by the interview guideline.

6.1.2 Positionality

It is important to briefly revisit my positionality as the researcher, as previously explored in **3.6**. Despite the full acknowledgement of the influence that my life experiences and world views on the study's findings, it is crucial part of good academic practice to be as transparent as possible in acknowledgement of my inherent biases as the researcher. My passion for outdoor sports and background in ecology has likely played an important role in shaping my world views surrounding human-nature interactions, which was addressed through striving for neutrality in my question formulation and interpretation. Alongside this, my prior association with many of the participants may have fostered a more open dialogue, with any biases from this prior association acknowledged and mitigated. My role as an English conversation facilitator at KZN might have influenced the dynamics of the interviews, a factor continuously checked to maintain the research focus. Acknowledging these aspects emphasizes the interpretive nature of this study and its findings.

6.2 Wider Implications and Future Research

The revelation of an Urgent Biophilic behavioural response accentuates the importance of natural areas in addressing well-being and resilience issues, specifically in crisis scenarios. The recognition of the therapeutic benefits that can be gained from nature immersion could inform interventions aimed at enhancing mental well-being through ecotherapy and nature-based solutions.

Such research has profound implications for urban planners, especially in geographical locations where natural disasters are a habitual occurrence. Having accessible local green spaces within an urban environment could be formative in increasing a community's resilience within a crisis scenario, and therefore, recognizing natural areas as more than just recreational spaces should be integrated into urban planning and educational frameworks. This acknowledgment of natural areas as crucial nurturing spaces could also be utilized to

promote conservation efforts and environmentally centred education programs. Teaching the well-being benefits associated with visiting natural areas within a school curriculum could play an important role in improving well-being parameters among children and adolescents.

This study, while providing an insightful overview, merely scratches the surface of the intricate web of human-nature interactions and their manifestations in times of crisis. Future research into the manifestations of urgent biophilia among adolescents could encompass a broader and more diverse participant pool, including adolescents from different cultures, socio-economic backgrounds, and geographical localities. Encompassing a broader participant pool would contribute to a more representative and comprehensive understanding of the evolving human-nature relationships amidst a crisis scenario, within this demographic. Additionally, the temporal effects of changing relationships with nature, post-crisis scenario, could be explored. This would provide insights into whether observed changes in human-nature interactions during a crisis scenario revert back to their original state or continue evolving over time. This thesis has shown that a crisis scenario has the potential to increase adolescents' engagement and relationship with natural areas, within the Canton of Zurich context, a location with abundant green space access. Future research could investigate how adolescents living in dense metropolitan areas deal with crisis scenarios, to discern if there is a correlation between well-being parameters and greenspace access.

7 REFERENCES

Alcock, I., White, M. P., Wheeler, B. W., Fleming, L. E., & Depledge, M. H. (2014). Longitudinal effects on mental health of moving to greener and less green urban areas. *Environmental science & technology*, *48*(2), 1247-1255.

Balmford, A., Cowling, R. M., Mace, G. M., & Vira, B. (2005). Human–nature interactions in the Anthropocene: Potentials of social–ecological systems analysis. In A. Mooney, J. Cropper, S. Reid, & W. Morgan (Eds.), The Millennium Ecosystem Assessment: Ecosystems and Human Well-being (Vol. 5, pp. 569-613). Island Press.

Beatley, T. (2011). Biophilic cities: integrating nature into urban design and planning. Island Press.

Beatley, T. (2008). Toward biophilic cities: strategies for integrating nature into urban design. *Biophilic design*, 277-305.

Beatley, T., & Newman, P. (2013). Biophilic cities are sustainable, resilient cities. *Sustainability*, *5*(8), 3328-3345.

Bruni, C. M., Schultz, P. W., & Woodcock, A. (2021). The Balanced Structure of Environmental Identity. *Sustainability*, *13*(15), 8168.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology*, *3*(2), 77-101.

Balundė, A., Perlaviciute, G., & Truskauskaitė-Kunevičienė, I. (2020). Sustainability in youth: Environmental considerations in adolescence and their relationship to pro-environmental behavior. *Frontiers in psychology*, *11*, 582920.

Berdejo-Espinola, V., Suárez-Castro, A. F., Amano, T., Fielding, K. S., Oh, R. R. Y., & Fuller, R. A. (2021). Urban green space use during a time of stress: A case study during the COVID-19 pandemic in Brisbane, Australia. *People and Nature*, *3*(3), 597-609.

Bratman, G. N., et al. (2020). Nature and mental health: An ecosystem service perspective. Science Advances, 6(31), eaba8313.

Brinkmann, S. (2013). *Qualitative interviewing*. Understanding Qualitative Rese.

Bratman, G.N., Hamilton, J.P., & Daily, G.C. (2012). The impacts of nature experience on human cognitive function and mental health. Annals of the New York Academy of Sciences, 1249(1), 118-136.

Berman, M.G., Kross, E., Krpan, K.M., Askren, M.K., Burson, A., Deldin, P.J., Kaplan, S., Sherdell, L., Gotlib, I.H., & Jonides, J. (2012). Interacting with nature improves cognition and affect for individuals with depression. Journal of Affective Disorders, 140(3), 300-305

Cheng, J. C. H., & Monroe, M. C. (2012). Connection to nature: Children's affective attitude toward nature. *Environment and behavior*, *44*(1), 31-49.

Corbin, J., & Strauss, A. (2008). Qualitative research. *Techniques and procedures for developing grounded theory*, *3*.

Clayton, S. (2003). Environmental identity: A conceptual and an operational definition. *Identity and the natural environment: The psychological significance of nature*, 45-65.¨

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.

Creswell, J. W., & Poth, C. N. (2016). *Qualitative inquiry and research design: Choosing among five approaches*. Sage publications.

Darcy, P. M., Taylor, J., Mackay, L., Ellis, N. J., & Gidlow, C. J. (2022). Understanding the Role of Nature Engagement in Supporting Health and Well-being during COVID-19. *International journal of environmental research and public health*, *19*(7), 3908.

Deplazes-Zemp, A., & Chapman, M. (2021). The ABCs of relational values: Environmental values that include aspects of both intrinsic and instrumental valuing. *Environmental Values*, *30*(6), 669-693.

Dzhambov, A. M., et al. (2021). Nature and mental health during the COVID-19 pandemic: A nationwide survey in Bulgaria. Ecological Applications, 31(1), e02352.

DiCicco-Bloom, B., & Crabtree, B. F. (2006). The qualitative research interview. *Medical education*, *40*(4), 314-321.

Dietrich, N., Kentheswaran, K., Ahmadi, A., Teychené, J., Bessière, Y., Alfenore, S., ... & Hébrard, G. (2020). Attempts, successes, and failures of distance learning in the time of COVID-19. *Journal of Chemical Education*, *97*(9), 2448-2457.

Dwyer, S. C., & Buckle, J. L. (2009). The space between: On being an insider-outsider in qualitative research. *International journal of qualitative methods*, *8*(1), 54-63.

Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American journal of theoretical and applied statistics*, *5*(1), 1-4.

Fargas-Malet, M., McSherry, D., Larkin, E., & Robinson, C. (2010). Research with children: Methodological issues and innovative techniques. *Journal of early childhood research*, *8*(2), 175-192.

Federal Statistical Office. (2019). Zurich. Retrieved 23 July 2023, from https://www.bfs.admin.ch/bfs/en/home/statistics/regional-statistics/regional-portraits-key-figures/cantons/zurich.html

Federal Statistical Office. (2022). Zurich. Retrieved 23 July 2023, from https://www.bfs.admin.ch/bfs/en/home/statistics/national-economy/national-accounts/gross-domestic-product-canton.assetdetail.23526492.html

Firat S, Gül H. The relationship between problematic Smartphone use and psychiatric symptoms among adolescents who applied to psychiatry clinics. *Psychiatry Res.* 2018 doi: 10.1016/j.psychres.2018.09.015.

Gray, S., & Kellas, A. (2020). COVID-19 has highlighted the inadequate, and unequal, access to high quality green spaces. *The bmj opinion*, *3*.

Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. *Field methods*, *18*(1), 59-82.

Gullone, E. (2000). The biophilia hypothesis and life in the 21st century: increasing mental health or increasing pathology?. Journal of happiness studies, 1(3), 293-322.

Gould, R. K., Merrylees, E., Hackenburg, D., & Marquina, T. (2023). "My place in the grand scheme of things": perspective from nature and sustainability science. *Sustainability Science*, 1-17.

Golley, F. B. (1993). *A history of the ecosystem concept in ecology: more than the sum of the parts*. Yale University Press.

Gössling, S., Scott, D., & Hall, C. M. (2020). Pandemics, tourism and global change: a rapid assessment of COVID-19. *Journal of sustainable tourism*, *29*(1), 1-20.

Hughes, J., Rogerson, M., Barton, J., & Bragg, R. (2019). Age and connection to nature: when is engagement critical? Frontiers in Ecology and the Environment. https://doi.org/10.1002/fee.2035

Haas, B. W., Hoeft, F., & Omura, K. (2021). The role of culture on the link between worldviews on nature and psychological health during the COVID-19 pandemic. *Personality and individual differences*, *170*, 110336.

Hofer, S. I., Stern, E., & Ziegler, E. (2017). Educational tracking in early adolescence: To what extent does intelligence prevail?.

Hinds, J., & Sparks, P. (2008). Engaging with the natural environment: The role of affective connection and identity. *Journal of environmental psychology*, *28*(2), 109-120.

Hull, E. V. (2012). Climate Change and Aquatic Invasive Species: Building Coastal Resilience Through Integrated Ecosystem Management. *Geo. Int'l Envtl. L. Rev.*, *25*, 51.

Ives, C. D., Giusti, M., Fischer, J., Abson, D. J., Klaniecki, K., Dorninger, C., ... & Von Wehrden, H. (2017). Human–nature connection: a multidisciplinary review. *Current Opinion in Environmental Sustainability*, *26*, 106-113.

Jackson, S. B., Stevenson, K. T., Larson, L. R., Peterson, M. N., & Seekamp, E. (2021). Outdoor activity participation improves adolescents' mental health and well-being during the COVID-19 pandemic. *International Journal of Environmental Research and Public Health*, *18*(5), 2506.

Jackson, S. B., Stevenson, K. T., Larson, L. R., Peterson, M. N., & Seekamp, E. (2021). Connection to nature boosts adolescents' mental well-being during the COVID-19 pandemic. *Sustainability*, *13*(21), 12297.

Kaplan, S. (1995). The restorative benefits of nature: Toward an integrative framework. *Journal of environmental psychology*, *15*(3), 169-182.

Kahn Jr, P. H. (1997). Developmental psychology and the biophilia hypothesis: Children's affiliation with nature. *Developmental review*, *17*(1), 1-61.

Kellert, S., & Calabrese, E. (2015). The practice of biophilic design. *London: Terrapin Bright LLC*, *3*, 21-46.

Kellert, S. R. (2008). Dimensions, elements, and attributes of biophilic design. *Biophilic design: the theory, science, and practice of bringing buildings to life*, 3-19.

Kellert, S. R., & Wilson, E. O. (Eds.). (1993). *The biophilia hypothesis*. Island press.

Kuo, F. E., & Sullivan, W. C. (2001). Aggression and violence in the inner city: Effects of environment via mental fatigue. *Environment and behavior*, *33*(4), 543-571

Loran, C., Kienast, F., & Bürgi, M. (2018). Change and persistence: exploring the driving forces of long-term forest cover dynamics in the Swiss lowlands. *European journal of forest research*, *137*, 693-706.

Lumber, R., Richardson, M., & Sheffield, D. (2018). The seven pathways to nature connectedness: A focus group exploration.

Lin, B. B., Chang, C. C., Astell-Burt, T., Feng, X., Gardner, J., & Andersson, E. (2023). Nature experience from yards provide an important space for mental health during COVID-19. *npj Urban Sustainability*, *3*(1), 14.

Lee, H., Seo, M. J., & Choi, T. Y. (2016). The effect of home-based daily journal writing in Korean adolescents with smartphone addiction. *Journal of Korean medical science*, *31*(5), 764-769.

Leopold, Aldo, 1886–1948. (1949). *A Sand County Almanac, and Sketches here and there*. New York: Oxford University Press

Marconi, P. L., Perelman, P. E., & Salgado, V. G. (2022). Green in times of COVID-19: Urban green space relevance during the COVID-19 pandemic in Buenos Aires City. *Urban Ecosystems*, *25*(3), 941-953.

MacKinnon, M., MacKinnon, R., Pedersen Zari, M., Glensor, K., & Park, T. (2022). Urgent Biophilia: Green Space Visits in Wellington, New Zealand, during the COVID-19 Lockdowns. *Land*, *11*(6), 793.

Mayer, F. S., & Frantz, C. M. (2004). The connectedness to nature scale: A measure of individuals' feeling in community with nature. *Journal of environmental psychology*, *24*(4), 503-515.

Morse, J. W., Gladkikh, T. M., Hackenburg, D. M., & Gould, R. K. (2020). COVID-19 and human-nature relationships: Vermonters' activities in nature and associated nonmaterial values during the pandemic. *PloS one*, *15*(12), e0243697.

Milliken, S., Kotzen, B., Walimbe, S., Coutts, C., & Beatley, T. (2023). Biophilic cities and health. *Cities & Health*, *7*(2), 175-188

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. sage.

Minor, K., Glavind, K. L., Schwartz, A. J., Danforth, C. M., Lehmann, S., & Bjerre-Nielsen, A. (2023). Nature Exposure is Associated With Reduced Smartphone Use. *Environment and Behavior*, *55*(3), 103-139.

Nutsford, D., et al. (2013). Nature and mental health: An ecosystem service perspective. Science Advances, 6(31), eaba8313.

Ochieng, P. A. (2009). An analysis of the strengths and limitation of qualitative and quantitative research paradigms. *Problems of Education in the 21st Century*, *13*, 13.

Pouso, S., Borja, Á., Fleming, L. E., Gómez-Baggethun, E., White, M. P., & Uyarra, M. C. (2021). Contact with blue-green spaces during the COVID-19 pandemic lockdown beneficial for mental health. *Science of The Total Environment*, *756*, 143984.

Robinson, J. M., Brindley, P., Cameron, R., MacCarthy, D., & Jorgensen, A. (2021). Nature's role in supporting health during the COVID-19 pandemic: A geospatial and socioecological study. *International journal of environmental research and public health*, *18*(5), 2227.

Roberts, B. W., Walton, K. E., & Viechtbauer, W. (2006). Personality traits change in adulthood: reply to Costa and McCrae (2006).

Rose, G. (1997). Situating knowledges: positionality, reflexivities and other tactics. *Progress in human geography*, *21*(3), 305-320.

Rands, M. R., Adams, W. M., Bennun, L., Butchart, S. H., Clements, A., Coomes, D., ... & Vira, B. (2010). Biodiversity conservation: challenges beyond 2010. *science*, *329*(5997), 1298-1303.

Roe, J. J., Thompson, C. W., Aspinall, P. A., Brewer, M. J., Duff, E. I., Miller, D., ... & Clow, A. (2013). Green space and stress: Evidence from cortisol measures in deprived urban communities. *International journal of environmental research and public health*, *10*(9), 4086-4103.

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

Soga, M., Evans, M. J., Tsuchiya, K., & Fukano, Y. (2021). A room with a green view: the importance of nearby nature for mental health during the COVID-19 pandemic. *Ecological Applications*, *31*(2), e2248.

Small, N., Munday, M., & Durance, I. (2017). The challenge of valuing ecosystem services that have no material benefits. *Global environmental change*, *44*, 57-67.

Santelli, J. S., Rosenfeld, W. D., DuRant, R. H., Dubler, N., Morreale, M., English, A., & Rogers, A. S. (1995). Guidelines for adolescent health research: a position paper of the Society for Adolescent Medicine. *Journal of adolescent health*, *17*(5), 270-276.

Samangooei, M., Saull, R., & Weinstein, N. (2023). Access to nature fosters well-being in solitude. *Sustainability*, *15*(6), 5482.

Seeland, K., Dübendorfer, S., & Hansmann, R. (2009). Making friends in Zurich's urban forests and parks: The role of public green space for social inclusion of youths from different cultures. *Forest Policy and economics*, *11*(1), 10-17.

Soulé, M. E. (1985). What is conservation biology?. *BioScience*, *35*(11), 727-734.

Sessions, G., & Devall, B. (1985). Deep ecology. *Salt Lake Cituy: Peregrine Smith Books*.

Scannell, L., & Gifford, R. (2010). Defining Place Attachment: A Tripartite Organizing Framework. Journal of Environmental Psychology, 30(1), 1–10

Swinnen, J., & McDermott, J. (2020). COVID-19 and global food security. *EuroChoices*, *19*(3), 26-33.

Schutz des Waldes. (n.d.). Retrieved July 22, 2023, from https://www.bafu.admin.ch/bafu/de/home/themen/wald/fachinformationen/strategien-und-massnahmen-des-bundes/schutz-des-waldes.html

Tang, S., Werner-Seidler, A., Torok, M., Mackinnon, A. J., & Christensen, H. (2021). The relationship between screen time and mental health in young people: A systematic review of longitudinal studies. *Clinical psychology review*, *86*, 102021.

Tomasso, L. P., Yin, J., Cedeño Laurent, J. G., Chen, J. T., Catalano, P. J., & Spengler, J. D. (2021). The relationship between nature deprivation and individual well-being across urban gradients under COVID-19. *International journal of environmental research and public health*, *18*(4), 1511.

Tillmann, S., Tobin, D., Avison, W., & Gilliland, J. (2018). Mental health benefits of interactions with nature in children and teenagers: A systematic review. *J Epidemiol Community Health*, *72*(10), 958-966.

Tidball, K. G., Krasny, M. E., Svendsen, E., Campbell, L., & Helphand, K. (2010). Stewardship, learning, and memory in disaster resilience. *Environmental Education Research*, *16*(5-6), 591-609.

Tidball, K. G. (2012). Urgent biophilia: human-nature interactions and biological attractions in disaster resilience. *Ecology and Society*, *17*(2).

Tidball, K. G., & Krasny, M. E. (Eds.). (2013). *Greening in the red zone: disaster, resilience and community greening*. Springer Science & Business Media.

Tidball, K. G. (2014). Urgent biophilia: Human-nature interactions in red zone recovery and resilience. In *Greening in the Red Zone* (pp. 53-71). Springer, Dordrecht.

Tschubby (2009). Karte Kanton Zürich Bezirke. Wikipedia. Retrieved July 23, 2023 from, https://commons.wikimedia.org/wiki/File:Karte_Kanton_Z%C3%BCrich_Bezirke.png

Ulrich, R. S., Simons, R. F., Losito, B. D., Fiorito, E., Miles, M. A., & Zelson, M. (1991). Stress recovery during exposure to natural and urban environments. *Journal of environmental psychology*, *11*(3), 201-230.

Ugolini, F., Massetti, L., Calaza-Martínez, P., Cariñanos, P., Dobbs, C., Ostoić, S. K., ... & Sanesi, G. (2020). Effects of the COVID-19 pandemic on the use and perceptions of urban green space: An international exploratory study. *Urban forestry & urban greening*, *56*, 126888.

Venter, Z. S., Barton, D. N., Gundersen, V., Figari, H., & Nowell, M. (2020). Urban nature in a time of crisis: Recreational use of green space increases during the COVID-19 outbreak in Oslo, Norway. *Environmental research letters*, *15*(10), 104075.

Wilson, E. O. (1984). Biophilia. In *Biophilia*. Harvard university press.

White, M. P., et al. (2020). Willingness to pay for greenspace during the COVID-19 pandemic. Ecological Economics, 183, 107932

Zambrano-Monserrate, M. A., Ruano, M. A., & Sanchez-Alcalde, L. (2020). Indirect effects of COVID-19 on the environment. *Science of the total environment*, *728*, 138813.

Zylstra, M. J., Knight, A. T., Esler, K. J., & Le Grange, L. L. (2014). Connectedness as a core conservation concern: An interdisciplinary review of theory and a call for practice. *Springer Science Reviews*, *2*(1), 119-143.

8 APPENDIX

8.1 INFORMED CONSENT FORM

Master Thesis Title: Urgent Biophilia During a Global Pandemic: How COVID-19 Has Affected Adolescents' Relational Values and Interaction with Natural Areas in the Canton of Zurich.

Aim of the study: To investigate whether adolescents' show signs of Urgent Biophilia in times of global crisis, and how is this reflected in their interaction with natural areas and changing relational values.

Confidentiality: All information collected during this study will be kept confidential. No identifying information will be included in any reports or publications resulting from this study. Only Tom Roethenbaugh will have access to the audio recordings of the interviews. Your name will not be used in any reports or publications.

Voluntary Participation and Right to Withdraw: Participation in this study is voluntary, and you may refuse to participate or withdraw from the study at any time. If you choose to withdraw, any data collected up to that point will be discarded and not included in the study.

Contact Information: If you have any questions or concerns about the study, please ask me now, or contact me after the interview (tomroethenbaugh@aol.com or +41787162580)

Consent: I have read the above information and understand the nature and purpose of this study. I agree to participate in this study, and I understand that I may withdraw from the interview at any time.

Participant Signature: _____

Researchers Signature: _____

Date: _____

8.2 INTERVIEW PROTOCOL

Welcome

- Introduce myself
- Introduce and explain the topic of the thesis:
  - Urgent Biophilia among adolescents during a global pandemic: A qualitative study on how COVID-19 has affected adolescents' relational values and interaction with natural areas in Canton Zurich.
- Explain the aim of the thesis
- Explain how I am defining 'nature' and 'natural areas'
- Explain confidentiality of interview and data processing and give form to sign.
- Explain that they can answer in German at any time, if they can't find the right words in English, or are struggling to express certain emotions/feelings in English.
- Ask for permission to record the interview.
- Thank you for participating.

Introduction and Ice-breaker

- Please could you tell me about your favourite natural area in canton Zurich?
  - Has this favourite place changed since the beginning of the pandemic?

  -Tell me about why you value this place, and how does visiting this space benefit you personally?
- What natural environments do you find most calming and restorative? (i.e. specific physical features: water, trees, open spaces) And why?
- What do you value about spending time in natural areas in general? What does nature mean for you?
- Can you describe any experiences you have had where being in nature helped you cope with stress or difficult emotions?

Pre-pandemic experience

- SET THE SCENE pre pandemic (weekday/weekend……)

  If you think back before the pandemic, tell me about your daily life?

(social/recreation/sport etc)

- Tell me about your time spent outdoors before the pandemic? (Location/Activity/Reason/Amount of time)
- What did you appreciate and value about this time you spent outdoors in these natural areas before the pandemic?
- Tell me about how your appreciation of natural areas has changed throughout your teenage years? /what you appreciated changed?

- Could you describe your sense of connection to nature prior to the pandemic?

Experience during the pandemic

- SET THE SCENE - If you think back to the pandemic, tell me about your daily life and how it was affected?
- How did the pandemic effect your mental well-being? (stressful/lonely etc)
- How did time spent outdoors in natural areas play a role in your daily life? (location/activity/motivation/lockdown vs non-lockdown/potential barriers?

- Did you feel the desire to spend more time outside in natural areas during the pandemic? (garden/balcony)
- How has spending time in natural areas helped you cope with the stress and uncertainty of the pandemic?
  - Tell me about what you valued/appreciated about spending time in natural areas during the pandemic?
    (social/recreation/sport/well-being etc)
  - Tell me about how your relationship with nature has been influenced by the pandemic? Do you feel more/less connected? What was the pandemics role in this?
  - Is your house/apartment in close proximity to green areas?
    View from window? – Distance from forest/park/farmland?
  - How did this location effect your experience during the pandemic?
  - Did you associate the dangers posed by COVID-19 with urban environments in particularly?

Possible follow up questions (if not already covered)?

- How has the pandemic affected your perceptions of the role that nature plays in our lives and our society?
- Can you describe any moments during the pandemic where you felt a strong and urgent desire to connect with nature? If so, what did you do, and how did it make you feel?
- In your opinion, how important is feeling connected to nature in our daily lives, and did the pandemic increase this necessity?
- When doing a sporting r social activity outdoors in natural areas, do you feel a phycological difference to when you do such an activity indoors or in an urban setting?
- Has your attitude to environmental protection been changed by the pandemic?

Conclusion and broader questions

- Tell me about how your everyday life has changed since the pandemic? (Back to normal? What has changed?)
- Have your visits to natural areas changed since the end of pandemic? (activity/location/reason…)
    - Do you have younger siblings? If so how old are they (DOB), and do you think that you could comment on how the pandemic influenced their behaviour in regards to going outside/visiting natural areas during the pandemic? How was it different to yours?
    - Have you lived in Zurich/Switzerland all your life? - How many years? Where else have you lived?
    - DOB/Postcode
    - Nationality and parents' nationality/profession
    - Living situation (Live alone/both parents/one parent etc)
    - Main mode of transport (bicycle/car/public transport etc)

9 PERSONAL DECLARATION

I hereby declare that the submitted Thesis is the result of my own, independent work. All external sources are explicitly acknowledged in the Thesis.

Thomas Roethenbaugh, 30.09.2023