Nature connection and its relationship with mindfulness and well-being

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Abstract

Humans evolved in nature as a creation of nature, ultimately resulting in a profound connection that has shaped the foundations of our nervous system. Throughout history humans have gone to considerable lengths to maintain contact with nature based on the notion that natural environments promote physical and psychological well being. Recent literature has begun to explore the relationship between nature connection, well being and mindfulness in detail. Much of the previous literature focused on exploring the effects of nature through subjecting people to a nature based therapeutic intervention, whereas this research investigated the benefits of nature connection on well being and mindfulness within the general population in the context of their daily lives. This investigation explored the relationship within a general population sample in Auckland, New Zealand. Participants (n = 472) completed a survey questionnaire measuring nature connectedness, hedonic well being, eudemonic well being, stress, mindfulness and average time spent in nature per month. The results yielded a significant positive relationship between nature connection and positive affect, overall meaning in life, presence of meaning, overall mindfulness and the observing, describing, non reactivity and non judgemental facets of mindfulness. Additionally, nature connection was significantly associated with less perceived stress, and time spent in nature was significantly associated with nature connectedness. These findings support the previous literature that suggest a cyclical relationship where nature exposure leads to positive well being outcomes and increased nature connection, therefore increasing the probability of re-engaging with nature. Furthermore, natural settings appear to facilitate mindfulness and mindful techniques can be utilised to develop connectedness and experience positive well being outcomes more efficiently. While these findings have been observed previously in the context of an intervention, this study demonstrates these effects in the general population in terms of their everyday lives, indicating that along with short term benefits, there are also long term benefits on well being from nature connection.

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Introduction

The development of our species is a consequence of an extensive evolutionary journey predicated on our inseparable relationship with the natural environment. Evolutionary success meant that humans were able to perform actions in such a way that proved a certain level of mastery of the surrounding environment. We found a niche. Primitive neurological loops allowed for specific actions which increased the likelihood of survival (e.g. detecting snakes or jerking your hand away from something hot). These loops are conserved today and serve as the foundation of our very structure (Peterson, J. 2014). In order to survive, human beings had to learn how to operate within the boundaries of the natural world. Over time, an ambivalent relationship was built. On one hand nature gives, as it is the source of all things. Yet it takes, surrounds us, transcends our knowledge and is eventually what kills us (Peterson, J. 2014). This seemingly paradoxical relationship forged the foundations of our nervous system. Demonstrating how we evolved in nature, as a creation of nature.

Throughout history, humans have gone to considerable lengths in order to maintain contact with nature (Ulrich, R. S., 1993). Ancient Egyptian gardens of the nobles, stories of the Garden of Eden and the influential gardens in ancient Rome are just a few of many historical accounts characterising the importance of maintaining this contact. In more recent times intense technological development has led to a rapid increase in human manufactured change, causing a shift towards material societies. However urban planning frequently caters towards providing public parks and preserving nature reserves based on the notion that these natural environments promote both psychological and physical well-being (Parsons, R., 1991). Not only are these landscapes available, they are largely frequented. It is not uncommon to travel long distances just to visit the beach, or take a short walk to the local forest. Our strong affiliation with nature is also evidenced by enjoyment in having

contact with, or viewing other animals (Gullone, E. 2000). In New Zealand alone, nearly two thirds of households have at least one companion animal (Companion Animals New Zealand, 2020). Since the opening of Auckland Zoo in December 1992 over 28 million visitors have passed through the gates while in recent years an average of over 700,000 people visit annually. There is no shortage of the desire to experience wild landscapes, or to be in awe of the beauty that natural processes possess.

With less opportunity to experience nature in our accrescent material world the endeavour to maintain contact remains. Clearly we yearn for these environments. The innate tendency to seek an affiliation with nature and other forms of life is the fundamental tenet behind Wilson's (1984) biophilia hypothesis. According to biophilia it is inconceivable that the natural environment has not played a significant role in forming our emotional and cognitive mechanisms. Given our history as sustenance gatherers, hunters and farmers, a tendency to affiliate with nature ostensibly enhanced the fitness of our ancestors (Gullone, E. 2000). Consequentially the brain and body we have inherited must be a result of an evolutionary process in which tailored its function toward extracting, processing and critically examining information from the natural environment (Wilson, E. O. 1984). Despite this evident affiliation and attraction there is significant variability in the degree to which individuals are drawn to nature (Nisbet et al., 2009). Given the premise of biophilia, recent literature has developed measurement scales to assess one's level of 'nature relatedness' or 'nature connectedness' (Nisbet et al., 2009; Mayer & Frantz, 2004). Although nature connectedness has been defined in a variety of ways in the last 20-30 years a strong focus on the topic has centred around developing an understanding of how nature influences our well-being and its relationship with mindfulness.

Van Gordon et al (2018) describe nature connectedness as a "realisation of our shared place within nature" (p. 1). Highlighting an interconnectedness in which any particular phenomena is connected to all other phenomena. Others have described this connection as an "experiential sense of oneness

with the natural world (Mayer & Frantz, 2004, p. 504) or an effective, experiential and cognitive relationship which entails a subjective sense of connection with nature (Nisbet et al., 2009). Aspy and Proeve (2017) draw on social connectedness which is a powerful psychological need associated with a variety of well-being indices. In contrast social isolation is a significant predictor of disease and death as well as a primary reason behind why people seek psychological counsel (Baumeister & Leary, 1995). Aspy and Proeve (2017) suggest that nature connectedness shares a similar bi-directional pattern where high levels of nature connection predict greater well-being and lower levels predict lower well-being. The ecopsychology perspective describes our interconnectedness with nature as our ecological identity, or the ecological self (Naess, A. 1973). An ecological self is composed of the individual identity, both human and other groups of species and the planet's ecosystems (Conn, S. 1998). As a result damage to the earth's ecosystem is conceptualised as damage toward the self and vice versa. This perspective puts forth the argument that both physical and mental health are interwoven with the state of the earth's ecosystem and that a fragmented relationship with nature negatively affects our psychological well-being (Conn, S. 1998). Nisbet et al (2010) support the notion that human psychological health is associated with the state of the environment as well as time spent in nature. Furthermore, an individual's subjective sense of connection with nature is likely to contribute towards their well-being. This notion is well represented in Maori culture in New Zealand. A Maori worldview typically views all parts of nature to have a life force, or 'mauri'. When these natural resources are not well cared for their mauri is weakened, causing a direct detrimental impact on health and well-being. The connection is also regarded as spiritual and part of the identity of both the individual and community. A common theme amongst all conceptualisations of nature connection is that we share a symbiotic relationship with the environment. One simply cannot exist without the other. After all, we are nature. Van Gordon et al (2018) suggest that an effective way to appreciate our interconnectedness with nature is to realise that "when we breathe in, we breathe in the out-breath of plants, shrubs and trees. When we breathe out, we breathe out the in-breath of flowers, animals and birds" (p.1).

Although the essence of human nature deems that we are akin to nature, the relationship we share varies across cultures. On the surface this appears to be obvious based on the different environments in which cultures have prospered over the years. For example in New Zealand we have an abundance of greenery, are surrounded by water and have no predatory animals threatening us. In comparison Saharan cultures in Northern Africa experience a much hotter climate, minimal accessibility to water, predatory animals and have no forestry. Given the aforementioned example above it is reasonable to assume that on average, New Zealanders would fare better in their local environment than in the Sahara desert. Despite sharing a long history of evolution the immediate environments that we inhabit and experience are largely unique. As a result preferences for natural landscapes may in fact be cultural. Buijs et al (2009) discovered that immigrants from Islamic countries expressed less preference for wild landscapes in comparison to Dutch citizens. These findings appear to reflect an inherent preference toward natural environments based on cultural norms and prior positive experience in them, indicating that early positive experiences in nature aid in the development of connectedness. Interestingly some have discovered all types of natural environments to be equally effective in producing positive affect (e.g. McMahan & Estes, 2015) while others found 'wild' landscapes such as forests or mountains to be more restorative than urban greenspaces (e.g. White et al., 2013). Perhaps within these studies individual differences were a result of their prior experience in each particular environment. Nonetheless the evidence does not appear to be conclusive. It is important to note that not all experiences in nature are entirely positive. Davis & Gatersleben (2013) found that 'wild' cliffs elicited feelings of awe in participants who were already high in nature connection whereas those with lower connection experienced fear and disturbance. Furthermore perceived danger seemed to compromise the restorative effects drawn from natural environments in Herzog and Rector's (2008) research. While these findings highlight the fears attached to nature experiences it is well known that incremental voluntary exposure towards fears produces significant development in the character of the individual.

Therefore by confronting these fears individuals open themselves up to the opportunity to experience the benefits of nature that they may have missed previously and increase their connectedness. The importance of positive contact with nature in childhood is increasingly publicised over recent years and may contribute towards early development of a positive relationship with nature (Hamann & Ivtzan, 2016). Therefore potentially limiting the fears and disturbances that are present at later stages in life for those who are low in connectedness as well as providing the opportunity to experience the vast array of potential benefits that nature has to offer.

Prior to detailing the method and evaluating the results of this current research project, an in depth review will be provided exploring the meaning of well being and mindfulness. Followed by a review of the dominant theoretical perspectives on why we are drawn to nature as well as why nature connection appears to produce beneficial effects on both well being and mindfulness. Lastly, an overview of the current literature which demonstrates these beneficial effects will be outlined. Highlighting the aspects of well being and mindfulness which appear to be related and improved.

Well being

In order to examine the effects nature connectedness has on well-being it is imperative to establish a clear understanding of what well-being means. Naturally, due to the variation of value structures across individuals and cultures it is impossible to provide one universal definition. Therefore we will consider some of the dominant theories and dimensions of well-being that have been established over the years. Two main approaches emerged from an exhausting body of literature: hedonic well-being, which typically accentuates short term positive affect, low negative affect, happiness and life satisfaction; and eudemonic well-being, commonly conceptualised as positive psychological functioning and individual development or growth (Dodge, et al. 2012). Bradburn's (1969) influential

research distinguished between positive and negative affect, indicating that happiness is achieved by cultivating a balance between the two. More specifically, an individual high in psychological well-being will have an excess of positive affect compared to negative. Conversely an excess of negative over positive affect reflects an individual with lower psychological well-being. Similarly hedonic well-being is based on achieving a balance of positive emotion, reduced or absent negative emotion and having satisfaction with life (Dagenais-Desmarais & Savoie, 2012). Positive emotion typically refers to pleasantness or pleasurable affect whereas negative emotion refers to displeasure or negative affect. An affective response refers to feelings or emotions as a result of everyday experiences. Watson et al (1988) suggest that positive and negative affect are two distinct categories of emotion. Positive affect is the degree to which an individual feels active, alert and enthusiastic. High levels of positive affect reflect a state of immersed concentration, increased energy and pleasurable engagement, conversely low levels of positive affect is commonly characterised by lethargy or sadness. Negative affect is opposite to that of positive, commonly experienced as subjective distress and unpleasantness. This state contains a diverse variety of moods such as disgust, guilt, contempt, anger and nervousness while low negative affect is characterised by serenity and calmness (Watson et al., 1988).

Life satisfaction, perhaps the most subjective construct out of the three hedonic dimensions, refers to a cognizable sense of satisfaction with life (Diener & Suh, 1997). Satisfaction is generally calculated by the individual through evaluating their existing thoughts and emotions in their current state of life versus expectations of what they perceive their life should be (Pavot & Diener, 1993). Naturally as individuals grow with knowledge and experience their current life state will change along with their expectations, therefore rendering satisfaction with life as a fluid construct. Although some components to life satisfaction are relatively universal (e.g. good health or absence of illness/disease), value towards markers of success or satisfaction varies at the individual level based on what is considered important at the time. It is because of the difference in value structures at the

individual and societal level that conceptual frameworks for well-being struggle to remain applicable across the board, especially from western cultures to indigenous cultures. Much of the hedonic approach deals with affective responses which are for the most part state based and rely on the subjective experience of the individual. Thereupon focusing on short term snippets in time and limiting its validity in measuring long term well-being (Grimes, A. 2015). A profound criticism of the hedonic approach is that it reduces well-being to immediately gratifying experiences (Ryff, C, D. 1989). Though there are significant benefits to present well-being it is important to establish an understanding of how to cultivate well-being over the long term.

Eudaimonia's philosophical roots have been traced back to Ancient Greece, originally described by Aristotle as living in alignment with one's values, as one's true self or 'daimon' and fulfilling one's greatest potential (Pritchard et al., 2020). Today the eudemonic approach generally pursues the notion of living well through affluence of meaning in life, self-actualization and optimal functioning (Dagenais-Desmarais & Savoie, 2012; Ryff & Keyes, 1995). Despite the differences between hedonic and eudemonic approaches it is now common to conceptualise well-being as a multi dimensional construct (Diener, E. 2009). Consequently the inclusion of multiple frameworks produces a significant amount of diversity in the value attributed to each dimension of well-being which can limit its applicability across cultures. One of the predominant measures of eudemonic well-being is Ryff's (1989) scale of psychological well-being which focuses on six key dimensions; self-acceptance, positive relations with others, autonomy, environmental mastery, purpose in life and personal growth. Although this approach involves a small degree of short term pleasure it primarily focuses on meaningfulness and growth - a more enduring type of well-being (Bauer et al., 2008). To achieve eudemonia an individual would typically feel a sense of meaning in their life as well as feeling 'good'. Furthermore wellness outcomes from this perspective are much more likely to produce a rich, stable and long term state of well-being (Ryan & Huta, 2008). Meaning is a critical component in theories of eudemonic well-being and is woven into its philosophical underpinnings. Despite the subjective

nature of establishing a meaningful life it is clear that in doing so the risk of a variety of health issues (e.g. anxiety, depression, substance abuse, suicidal ideation and general forms of distress) is significantly reduced (Steger et al., 2006). Additionally, more meaning is related to increased enjoyment at work (Bonebright et al., 2000), happiness and life satisfaction (Debats et al., 1993) just to name a few. Steger et al's (2006) research further supported the notion that having a strong sense of meaning in life increases the ability to cope with adversity. Thus not only providing both short and long term well-being, meaning serves as a buffer against adverse life events that may otherwise impact the overall 'happiness' of the individual. Frankl V, E. (1963) argued that human beings are characterised by a will to meaning. That we are on a search to find significance in life and failing to do so leads to psychological distress. If we are able to find meaning we are then able to interpret and organise our experiences, develop a sense of worth, discover what brings meaning toward our life and direct our attention and energy towards such places (Steger M, F. 2009).

Stress is often used as a marker of well being in today's society. Stress, an organism's response to a particular stressor, can manifest itself biologically, psychologically and physiologically. It is often conceptualised as a negative experience however in controlled doses it can be incredibly beneficial. Conversely an excess amount can predict a wide range of both psychological and physical illness. Definitions of stress fluctuate in their foci from the subjective valuation that environmental threats pose (psychological stress), to objective characteristics of the environment that are threatening (stressful life events), to the activation of physiological mechanisms (e.g. fight or flight) that enable behavioural responses needed to deal with a threatening situation (Cohen et al., 2016). These mechanisms are thought to have evolved to support our capacity for adversity. In order to respond efficiently to a threat the physiological mechanisms that are required are mobilised while those that are not are suppressed. Thus enabling the ability to narrowly focus our energy for short term gain. Cohen et al (2019) outline four key theoretical perspectives within the stress literature that attempt to characterise what a stressful event entails: adaptation, which evaluates the stressfulness of a

particular event in relation to the amount of change or adaptation that it requires; threat or harm, defining stressful events as those that are consensually perceived as threatening or harmful and are scalable in their magnitude; demands exceed resources, where distress arises out of a lack of control over the characteristics of a situation due to insufficient resource; and interruption of goals, where the dissolution of major goals threatens one's identity and therefore their overall well-being. There is a clear overlap between these approaches. For example goal interruption likely results in threat and therefore a need to adapt. A stressful event will typically manifest itself through a combination of adaption, threat or harm, demands exceeding resources and goal interruption. It is important to note that the appraisal of a stressful event varies from person to person. For example person A may have a higher stress response for an exam than person B due to a lack of preparation. Furthermore the ability to cope with stress fluctuates across time and from person to person. A stress response will occur when there is an imbalance between a person's appraisal of the stressor, the relative demands of the situation and their ability to meet such demands (Lazarus & Folkman, 1987). Although humans are adapted to respond to stressors with minimal effect, chronic activation of these biological mechanisms can produce long-term adverse physiological and health effects (Kemeny, M. E., 2003). Generally speaking stressful life events seem to influence the risk of disease and illness through a variety of changes in physiology, dysregulation of anxiety and a change in behaviours such as sleep patterns or an increase in smoking, occurring as coping mechanisms (Cohen et al., 2019). It is inevitable that stressful events will eventuate in all walks of life. Therefore it is not as simple as desiring an absence of stress but developing resilience in such a way that increases one's capacity for adversity.

Positive, or healthy levels of well being appear to be reached when individuals experience a combination of both hedonic and eudemonic well being. Furthermore when one is able to respond to stressful life events in such a way that prevents the increased risk of illness and disease. Diener's (2009) claim that well being is a multi dimensional construct suggests that a combination of each of

these dimensions likely reflects a healthy, meaningful life while leaving significant variability to the variation of what different people or cultures conceive of as healthy and meaningful. Prior to analysing the relationship between nature connection and well being it is integral to outline what mindfulness is.

Mindfulness

Exploring the benefits that nature connection provides instinctively includes establishing an understanding of its interconnection with mindfulness. Naturally, they appear to share a significant reciprocal relationship due to their strong focus on attention. The origin of mindfulness lies in northeast India 25 centuries ago where the Buddha offered teachings called the Dhamma, which incorporates a set of principles and practices that assist human beings in a quest for spiritual freedom and happiness (Bodhi, B. 2011). Mindfulness is thought of as a state of consciousness which involves continuous attention towards moment to moment experiences (Shapiro et al., 2006). It is the skill or state to be achieved through practices such as meditation. A system of mindfulness training focuses on developing embodied awareness, emotional balance and clarity which leads to increased insight and the overcoming of suffering (Bodhi, B. 2011; Williams & Kabat-Zinn, 2011). This training became established as a learnable skill and began to spread throughout Asia where many of its lineages were created and have been preserved and practised to the present day.

In the last 40-50 years mindfulness has significantly increased in its popularity within the western world due to its known benefits on improving well being. Despite its popularity the field of psychology has struggled to produce an agreed upon definition. Two popular examples describe mindfulness as: “bringing one’s complete attention to the present experience on a moment to moment basis” (Marlatt & Kristeller, 1999, p.68) and “the awareness that emerges through paying

attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment" (Kabat-Zinn, J. 2003, p.2). Much of mindfulness practice relates to particular qualities of awareness and attention of the present moment (Baer, R. A. 2003). These experiences can be represented via emotional reactions, bodily sensations, mental talk and perceptual experiences such as touch and sound. Another critical component centres around developing an openness and acceptance towards the present experience in a curious, detached and non reactive manner which encourages inviting in such experiences even if they are arduous (Cresswell, J. D. 2017). These qualities contrast significantly with a substantial amount of our daily life experience as we tend to let our minds run on autopilot as well as suppress unwanted experiences (Kang et al., 2013). Killingsworth & Gilbert (2010) showed that roughly 47% of the time our minds are in this mindless state. Furthermore, this mind wandering predicted unhappiness. Contrarily, the ability to be mindful is associated with an increased level of well being (Brown & Ryan, 2003). Thus demonstrating a need in today's society to implement practices which can improve our ability to be present.

Jon Kabat-Zinn led the way in developing an integrative approach to the traditional eastern mindfulness philosophy and adapting it to suit the western world. In 1979 he founded the mindfulness based stress reduction (MBSR) clinic at the University of Massachusetts. Since then mindfulness has been incorporated into a number of other successful mental health interventions such as acceptance commitment therapy (ACT; Hayes, S. C. 1982) and mindfulness based cognitive therapy (MBCT; Teasdale et al., 2000). A common theme within mindfulness based psychological interventions is the development of an awareness and acceptance of mood changes which arise out of recurrent negative behaviours such as rumination or avoidance. Followed by the implementation of mindfulness practices which help to create alternative responses and schemas that are more desirable (Fennel & Segal, 2011). Moving forward, individuals increase their capacity to regulate and control their thoughts and emotions therefore reducing vulnerability towards negative health states.

Thus far, mindfulness based interventions such as MBSR have shown great promise in addressing both physical and mental health illnesses (Cresswell, J. D. 2017). Particularly in improving anxiety, depression, distress, rumination and overall well being (e.g. Dawson et al., 2020; Galante et al., 2021). It is important to note that while modern day mindfulness practice in the western world is and has been largely beneficial, they are watered down perspectives from its origin 25 centuries ago which have been adapted to suit the modern day environment. Health practitioners specialising in stress reduction are always seeking new methods to help their patients overcome and deal with grief, distress, and physical pain. The ancient system of mindfulness meditation provides unique promise (Bodhi, B. 2011).

Mindfulness and well being

Irrespective of the effects that nature has in relation to both well being and mindfulness, mindfulness independently is consistently linked to having a positive impact on health and well being across the lifespan. Mindfulness consists of a state of non judgemental awareness and presence (Brown & Ryan, 2003), as well as ensuring that in this present state one is devoid of constant planning, thinking and reminiscing which often clutters the mind (Kabat-Zinn, J. 2003). Those who demonstrate higher levels of trait mindfulness tend to experience greater positive affect, life satisfaction, less negative affect, increased autonomy and competence (Schutte & Malouff, 2018). Additionally, it is widely known to reduce levels of stress (Brown & Ryan, 2003). Tipsord (2009) found that those high in mindfulness experienced social benefits evidenced by feeling more connected to other people. This may be facilitated by an increase in empathy which has been known to increase after engaging in mindfulness based interventions (Shapiro et al., 2011). Higher levels of trait mindfulness have also been associated with better subjective well being, a reduction in symptoms of depression and anxiety and improved ability to regulate emotional, behavioural and

physiological responses to stressful situations (Sadowski et al., 2020). Interestingly, Baer et al (2008) posit that mindfulness can be broken down into five interacting categories: non judgement of thoughts and feelings, acting with awareness, non reactivity, observing and describing experiences. Furthermore, that each category may differentially predict psychological outcomes such as emotional intelligence, dissociation and self compassion.

Kabat-Zinn's (1979) MBSR is an example of a modern health intervention which utilises a variety of mindfulness practices over the course of eight weeks. MBSR aims to alleviate suffering that occurs in everyday life experiences through developing a non judgemental acceptance of such experiences resulting in an increase in psychological well being and emotion regulation (Baer, R. A. 2003). Participants who complete the MBSR programme on average bolster positive health and well being outcomes, improve cognitive performance, gain relief from depression, anxiety and emotional distress as well as reduce levels of general stress (Choe et al., 2020). Mindfulness is known to improve both hedonic and eudemonic aspects of well being. As more and more evidence of these beneficial effects comes to light, more health interventions are being designed, implemented and practised throughout society. In order to establish an understanding of the relationship between nature connection, well being and mindfulness the dominant theoretical perspectives driving this relationship must be explored.

Theory

Biophilia hypothesis

The most dominant theory that appears in an expansive body of literature within the nature connection field is Wilson's (1984) biophilia hypothesis. The fundamental tenet behind his hypothesis suggests that humans have an innate tendency to seek an affiliation with nature and

other forms of life. According to biophilia it is inconceivable that nature has not played a monumental role in forming our emotional and cognitive mechanisms. Given our extensive history of gathering, hunting and farming, the ability to affiliate with the natural environment unequivocally enhanced the fitness of our predecessors (Gullone, E. 2000). Consequentially, humans today have inherited a brain shaped by an evolutionary process in which tailored its function towards extracting, processing and critically examining information within the natural environment (Wilson, E. O. 1984). The evolution of biophilia has been proposed as biocultural where learning principles are spread throughout a particular culture causing the genes which facilitate biophilic tendencies to spread through the culture via natural selection. Thus making behaviours associated with nature connection more frequent. Adaptive behaviours that had been learned are thought to consist of both avoidance (biophobia) and approach (biophilia) responses to environmental stimuli (Ulrich, R. S. 1993). Individuals who learnt such behaviours were then able to adapt to the dangers and rewards that nature presents.

Charles Darwin first suggested the notion of prepotent fears which are instinctively arousing. Empirical data on phobias has supported Wilson's (1984) hypothesis that biophilia is mediated by rules pertaining to both positive and negative emotional experiences in nature. Humans are more likely to fear particular stimuli or situations than others. Seligman (1971) proposed that fears are much more likely to develop for things that can, or have posed a threat to human survival in our evolutionary history. These fears are characterised by a strong resistance to extinction, ease of procurement and resist influence by instructions or information in the moment (Gullone, E. 2000). An example of a prepotent fear is the significant prevalence of a phobia for snakes, especially in comparison to fearing the dentist. Furthermore, a fear of snakes is much more likely to be unrelated to prior exposure and experience with snakes. Therefore suggesting an evolutionary significance towards fearing snakes as they may have been a threat to hunter gatherer communities. Contrarily positive emotional experiences in nature are also considered as empirical evidence of biophilia.

Ulrich (1993) proclaims there was a significant advantage for those who acquired and retained a positive response towards natural environments which favoured survival. Such responses included restorative benefits from stress, adaptive approach behaviours and increased cognitive functioning. In a similar fashion to biophobia, biophilia suggests that we are genetically predisposed to increase attention, gain liking for and approach particular features that facilitate survival and adaptation. Features of this kind include bodies of water, abundance of food and opportunity for shelter. Human evolution predominantly took place in savanna like environments. Compared to dense bush they are proposed to have suited our upright, bipedal posture which enabled the ability to spot predators and avoid encounters with them due to open visual fields (Ulrich, R. S. 1993). Gullone (2000) suggests that it is because of this we tend to favour designing parks and nature preserves which are spatial and have expansive visual fields. Ulrich's (1999) aesthetic affective theory piggy backed off the evolutionary approach of biophilia. Suggesting that stress reducing effects from nature exposure are derived from ancient parts of the brain which extract information from natural settings, enabling us to know when we should be active and when we can rest as well as fight or flight.

Further support of biophilia lies in the body of literature which demonstrates significant well being and cognitive benefits when exposed to the natural environment and through having a strong connection with it. Although we now for the most part operate in a machine and material dominated environment this did not occur until extremely late in our evolutionary history. It is very unlikely that we have unlearned the value of nature which is embedded deep within our biology (Nisbet et al., 2010). Indeed 99% of our history involves hunter gatherer societies closely associated with other organisms (Gullone, E. 2000). After all, only a tiny minority of human life has existed in this urban, material world.

Attention restoration theory

Kaplan & Kaplan's (1989) attention restoration theory proclaims that natural environments can help to restore a depleted capacity for focused attention after individuals are worn out from dealing with a significant amount of demanding information and competitive stimuli. The central foci of this theory is that there are two categories of attention: directed attention, which is demanding and fascination which is rather effortless. Directed attention is used to solve complex problems as well as organise and process information (Stigsdotter et al., 2011). Typically today's society demands a significant amount of directed attention as we are constantly faced with a complex array of stimulation. Directed attention is a limited resource, therefore it can be easily overloaded when there is little opportunity to rest and recover from excess stress (Kaplan & Kaplan, 1989). Thus resulting in exhaustion. Fascination on the other hand is an information system which is relatively effortless and is in a sense unlimited. Fascination is particularly relevant in natural settings where our attention is utilised to explore environmental features (Stigsdotter et al., 2011). There are two types of fascination: hard fascination, occurring when settings are intense and completely capture one's attention, leaving no room for reflective cognitions; and soft fascination, where the setting is particularly interesting and holds attention while leaving room for reflective thoughts. For example soft fascination would be used when gazing at water or listening to the sounds of the forest. Whereas hard fascination would be used when in stormy weather or running through the forest. Attention restoration theory posits that humans can efficiently restore and recover when we are exposed to environments which encourage fascination opposed to directed attention. Soft fascination of nature has been argued to encourage individuals to become attentive to the natural environment which facilitates rest, calm and contemplation (Van Gordon et al., 2018). This is a welcoming experience providing an antidote to the demanding directive attention that is associated with a large number of tasks in modern day society (Hamann & Ivtzan, 2016). Kaplan & Kaplan

(1989) hypothesise that nature experiences have the capacity to renew attention after exerting mental energy. As a result our ability to focus and concentrate is largely improved (Ohly et al., 2016).

Eco psychology and meaning

The eco psychology perspective focuses on the relationship between humans and nature through the lens of reflection and reciprocity (Stigsdotter et al., 2011). Reciprocity is embodied in this relationship through nurturing the ecosystem which in turn provides us with a home and sustainable living. Reflection on the other hand is considered to be a powerful tool when combined with nature exposure, allowing us to develop new ways of thinking and learn from experiences in the past. Within the ecotherapy approach nature is utilised as an educator and therapist. Largely through metaphorical examples which facilitate learning and growth. Much like using the river as a meditative technique, nature can be used to provide an understanding of 'real life' situations (Stigsdotter et al., 2011). Furthermore human health is considered to be interconnected with the environment, emphasising the importance of our responsibility to promote the health of the ecosystem. This is perhaps why we experience positive emotions when in the presence of a healthy landscape. Meaning is unequivocally intertwined within our relationship with the natural world. Horticultural activities highlight a variety of values which are thought to cause its healing effects: our physical dependence on plants and their benefits; plants' aesthetic beauty, leading to fascination and awe; creating attachment through nurturing plants; and social interactions with others in this setting (Relf, P. D. 1999). The natural environment communicates with us through all five of our senses (Stigsdotter et al., 2011). Coupled with our cognitive capability to attend to the natural environment we can begin to develop a deep connection. For example when we look at the starry night sky it calls to us. It is a deep biological experience entailing a sense of awe which grips you and calls forth something out of you to respond to mortality, finitude, limitation, all of which in relation to the infinite (Peterson, J. B. 2022). That starry night sky is a reflection of the structure of the

cosmos itself. Thus putting us directly in touch with the very nature of reality. The eco psychology perspective along with attention restoration theory and the biophilia hypothesis are potential explanations for the beneficial effects nature appears to have on our well being.

Nature connection and well being

The environment we live in will not be the same in fifteen, twenty, to thirty years and beyond. History has taught us that we are constantly evolving. In many cases our evolution has drawn us away from the forests, open landscapes, mountains, beaches and so on. Though we should be incredibly grateful for the world we inhabit today for we have an abundance (especially in the western world) of goods and services at our fingertips. Our lifestyles have shifted in such a way that has significantly decreased the time we spend outside in nature. Swan J. A (2010) found that the average person typically spends around 95% of their time indoors with an average of roughly 8 hours of screen time per day. These figures represent the stereotypical 'office job'. While they may not reflect a true average they serve as a strong indicator that society has shifted majorly in this direction. Many of our health hazards are related to our current lifestyle. Today some of these include the increase in numbers of those living a sedentary life, having a lack of physical activity, chronic psychological stress and growing numbers who stay indoors (Stigsdotter et al., 2011). Mental illness and the pursuit of well being has garnered itself a significant amount of attention in recent years. We face challenges today that are much different to those we have faced in the past. Although human beings are gifted with the ability to adapt and overcome these challenges we may not need to look too far. We can shed light on the long held belief that our health and well being are positively influenced when we spend time in nature.

Hedonic well being

The garden is a concept dating back thousands of years and may have been regarded as a place of healing from the very start (Stigsdotter et al., 2011). In recent years there has been a spike in research assessing nature's ability to positively influence our well being. Both Sadowski et al (2020) and Nisbest et al (2010) found that individuals high in nature relatedness were much more likely to have greater levels of both positive affect and life satisfaction. Additionally, higher levels of nature relatedness were associated with negative affect. Therefore suggesting that not only does having a stronger connection with nature produce beneficial effects on positive dimensions of hedonic well being, it serves as a buffer against negative affect. These effects were consistent across three experiments examining nature's influence on hedonic well being with each incorporating a variety of study populations from students to full time workers (Nisbet et al., 2010). Spending time within the natural environment, even when in an unspectacular urban green space, appears to bolster subjective nature connectedness as well as enhance positive emotions (Mayer et al., 2009; Nisbet et al., 2019). White et al's (2013) research which examined data from over 10,000 residents in the United Kingdom found that living in a green area was associated with having more satisfaction with life than those in a more urban setting. Indicating that simply having green spaces around us can produce a positive effect hedonically. Although life satisfaction only increased by 1% on average for those in a green area it is entirely reasonable to ensure we have green spaces within, or surrounding our living quarters as it requires little to no cost yet provides benefit at the community level. A contrary perspective might argue that green spaces prevent opportunity for economic gain. For example a small nature reserve could be developed into a multi story car park, facilitating transport needs within the community. Nonetheless a happy medium appears to be desirable.

Human well being tends to flourish when in contact with, and having a sense of connection with the natural environment (Capaldi et al., 2015). Location of contact had a significant impact on the

relationship between nature exposure and both positive mood and subjective well being in Hamann and Ivtzan's (2016) research. The increase in positive mood and subjective well being was far more significant when participants were exposed to wild areas such as mountains or forests opposed to urban green spaces. Participants only experienced these significant increases when spending 30 minutes or more each day within these settings. Perhaps in order to produce a truly noticeable impact on hedonic well being the exposure towards nature has to be relatively prolonged and ideally include wild settings which are largely untouched. The benefits were not present in those that spent 15-30 minutes per day in nature, illustrating that there may be a buffering point in which the effects upscale as time in nature increases and the setting becomes wilder. It is however important to note that only 3 participants had spent 15-30 minutes in nature. Whereas Nisbet et al (2019) found that benefits to hedonic well being were most pronounced during direct exposure to nature even if the exposure was brief. Therefore suggesting that when we are in direct contact with nature we begin to develop feelings of subjective, state based nature relatedness as well as experience an increase of positive mood and vitality (Mayer et al., 2009).

Eudemonic well being

Two of the dominant researchers in the field of nature connection have developed measurement scales assessing one's connection to the natural world that are widely used among the community (Mayer & Frantz, 2004; Nisbet et al., 2009). Both of which inherently encompass hedonic and eudemonic aspects attributable to well being. The connectedness to nature scale (Mayer & Frantz, 2004) and nature relatedness scale (Nisbet et al., 2009) consist of affective responses towards an individual's subjective connection that align with hedonic well being. For example participants are asked to rank an affective experience such as "I enjoy being outdoors, even in unpleasant weather" (Nisbet et al., 2009) on a scale from disagree strongly to agree strongly. Eudemonic aspects of well

being however appear to be the dominant theme. Mayer and Frantz's (2004) connectedness to nature scale (CNS) attempts to evaluate an individual's experiential sense of oneness with nature. Items include the degree to which subjects feel they share a common life force with all others that inhabit earth, or the degree to which one feels they are part of a larger cyclical process of living. Comparatively in the nature relatedness scale (NRS) participants are asked how much they feel that their relationship with nature is an integral part of their identity. Clearly these techniques are targeting something deep and meaningful that appears to consistently manifest in our relationship with nature. This connection goes beyond experiencing positive or negative affect. It is common for humans to experience a profound connection that encompasses a sense of union with the universe (Hamann & Ivtzan, 2016).

Van Gordon et al (2018) highlight that direct exposure to nature in the form of touching wood from a tree or viewing images of flowers for just three minutes can induce beneficial psychological responses. Furthermore, having a strong connection with nature is associated with more meaningfulness, happiness, pro social behaviours as well as pro nature behaviours (Witt, A. H. D. 2013). Interestingly, time spent in or viewing natural settings correlates with an increase in pro social behaviours such as trust (Zhang et al., 2014). Nature appears to support the balance of our emotion regulation system, evidenced by lowering levels of depression (Hamann & Ivtzan, 2016), anxiety and increasing vitality (Van Gordon et al., 2018). Howell et al (2011) suggest that aspects of well being that have a strong emphasis on 'functioning well' are more reliably related to nature connection. In particular, both social and psychological well being were more strongly correlated to nature connection in all three experiments ($r = .230$ & $r = .270$) whereas emotional well being, which focuses on 'feeling good' was less associated with nature connection in two of three of their experiments ($r = .170$). Those who have a strong connection with nature derive a sense of meaningful co-existence from this relationship and this meaningful attachment may in turn boost well being. Nisbet et al (2010) describe a positive feedback loop where those high in nature

connection are more likely to exhibit pro environmental behaviours as well as be exposed to natural settings which in turn increases well being and their connection to nature. Eudemonic benefits included increased autonomy and meaning or purpose in life.

Having a subjective sense of meaning has been increasingly associated with nature exposure and connectedness. Passmore and Howell (2014) found that meaning mediated the relationship between well being and nature connectedness. Additionally, after spending several days in the wilderness participants experienced a stronger sense of meaning in life (Fredrickson & Anderson, 1999). Exposure to wild settings appears to produce the most significant increase in meaning (Hamann & Ivtzan, 2016). Those who are in frequent contact with nature tend to evolve from casual observers into developing a deep connection which incorporates awe, fascination and meaning, particularly in wild landscapes (Davis & Gatersleben, 2013). While wild settings appear to provide the most significant benefits, urban greenspaces are more effective than artificial spaces at increasing well being (Hamann & Ivtzan, 2016). Therefore suggesting that any nature is better than none at all. Due to the increase in awareness of benefits that nature exposure and connection provides the Canadian Mental Health Association has begun to train health professionals to run hiking programmes in nature for adults struggling with mental illness. Thus far these 'mood walks' have resulted in increased energy, happiness and decreased anxiety (Hamann & Ivtzan, 2016).

Stress and additional benefits

It is reasonable to assume that an individual who experiences all of the aforementioned benefits that nature exposure and connection provides will most likely have lower levels of stress, or at least have a greater capacity to deal with stress and therefore are less likely to be negatively impacted by it. Nature connection has garnered attention from its ability to reduce stress and provide a relaxing

and restorative effect which is largely influenced by a Japanese practice called Shinrin Yoku, or Forest Bathing. Shinrin Yoku is the practice of bathing in the forest's atmosphere while encouraging the awareness of all five senses. As a result the three stress hormones (cortisol, adrenaline and noradrenaline) are reduced, blood pressure decreases, individuals experience a preventative effect on hypertension, immune functioning improves as well as sleep quality (Li, Q. 2018). Thus aligning with Van Gordon et al's (2018) findings that nature brings balance to both our nervous system and emotion regulation system, producing an energising yet calming experience when spending time in nature. Indeed natural settings and nature have well documented healing, relaxation and restorative benefits (Laumann et al., 2001). Li (2018) contends that when we spend time in nature there is a natural harmony which allows us to reset our nervous system leaving us refreshed, restored and in alignment with our true selves. It is however important to note that Herzog and Rector (2008) found that when individuals experienced perceived danger while in nature they did not experience the restorative effects that a wild environment tends to provide. Highlighting that not every experience in nature is entirely beneficial.

Recuperative effects drawn from nature exposure have been shown to improve recovery from surgery. Patients who had ornamental plants and flowers in their hospital rooms post surgery experienced significantly more positive physiological responses, namely; lower blood pressure; decreased levels of pain; less anxiety; less fatigue and they evaluated their experience as much more positive than those in a similar room without plants (Park & Mattson, 2009). Playing in green spaces has also been shown to reduce symptoms of attention deficit disorder and attention deficit hyperactivity disorder in younger children (Li, Q. 2018; Taylor et al., 2001). Further evidenced by Haman & Ivtzan's (2016) research which highlighted an improvement in attention, productivity, creative and innovative thinking when spending time in a natural setting. Perhaps there is a connection between the reduction of stress symptoms and the enhancement of cognitive functioning when in a natural setting. Certainly, those who live in greener environments tend to

report less physical symptoms and have better physical and mental health than those who are deprived of nature exposure (Nisbet et al., 2010).

Nature connectedness, mindfulness and well being

Mindfulness and nature have a historic connection dating back thousands of years. Indian Buddhist Shantideva in the eighth century shared two famous quotes in his Guide to Bodhisattva Way of Life; "Until one is hoisted by four men and mourned by the world, one should retire to the forest"; "When shall I dwell in unclaimed and naturally spacious regions, wandering as I please and without a residence". Interconnectedness is a common concept in mindfulness and meditation literature which proclaims that "any given phenomenon is connected to all other phenomena" (Van Gordon et al., 2018, p. 1). An effective method in developing an understanding of how interconnectedness relates to us is to explore our connection with nature. As mentioned previously nature connection portrays an "experiential sense of oneness with the natural world" (Mayer & Frantz, 2004, p. 504) where we become aware of our shared place within the natural environment. This relationship can be drawn upon in a mutually beneficial manner where natural spaces can be used to aid in the development and sharpening of contemplative skills. Ultimately resulting in improved mindfulness and increased connection with nature.

There are a multitude of ways nature can be utilised to enhance mindful awareness. It can guide the direction and content of mindfulness meditation. One technique involves contemplating and observing certain properties of the environment. For example while sitting in meditation next to a river practitioners can ask complex questions such as: 'if I look away from the river for a short period and then return my gaze, is it then the same river? Questions such as these facilitate understanding of the natural law of impermanence: the first of the three marks of existence in Buddhist doctrine

which proclaims that everything in material existence is impermanent (Van Gordon et al., 2018). Contemplative meditation is a practice which highlights our interconnectedness with nature as we too come into being and then dissolve as evidenced by the ageing process. From the Buddhist perspective individuals should resist attachment as it is thought to cause suffering due to the inevitable finitude of that which one is attached to. Thus through understanding impermanence one can begin to walk the path of spiritual enlightenment.

Such perplexity and perspective into the infinite nature of the universe reduces the stressful demands of everyday life that we experience moment to moment and calms the mind. Furthermore, developing an awareness of the beautiful aspects that are a part of nature and how these influence our emotions strengthens our connectedness through intensifying our love for the natural world and its processes (Van Gordon et al., 2018). Our actions determine our sense of self. Thus by practising positive emotions that arise through mindfulness in nature it starts to become more prominent and therefore more apparent in everyday life. Interestingly, attending an MBSR programme in a natural environment versus an indoor or built outdoor environment resulted in more reflective attitudes and less rumination, both of which are aspects of eudemonic well being (Choe et al., 2020). There was no difference in hedonic aspects of well being between the three MBSR groups however those in the natural environment experienced more positive effects on stress relief. Certainly being psychologically and physically connected with nature includes a deep sense of meaning and co-existence with something much larger than oneself (Capaldi et al., 2015). Perhaps this effect is magnified when mindfulness is practised as it is known to foster an increased capacity for meaning making (Van Gordon et al., 2018). The positive effects from the MBSR programme lasted far longer for those in the natural environment which may be explained by its eudemonic promoting facets of nature connection (McMahan & Estes, 2015). Mindfulness at the trait level is conducive to the positive outcomes that come from exposure to nature (Unsworth et al., 2016). Therefore producing

a reciprocal effect in which mindfulness enhances nature experience, resulting in an increase in nature connection and enhancing the wide variety of well being outcomes from nature experiences.

The amplified sensory impact of nature experiences facilitated by mindfulness techniques strengthens nature connectedness (Howell et al., 2011; Unsworth et al., 2016). Mindfulness, at least to a reasonable degree, mediates the relationship between well being and nature connectedness (Van Gordon et al., 2018). The benefits of mindfulness practice seem to be derived from increased information processing and attention regulation leading to greater self reflection. Nisbet et al (2019) suggest that through these mechanisms being mindful in natural environments increases one's ability to connect with nature and experience its benefits much more efficiently. Even when exposure is short lived these mindful techniques can be utilised to maximise the benefits within a smaller window. Hamann & Ivtzan (2016) found that those higher in trait mindfulness were more likely to engage in environmentally friendly behaviours and to feel connected to nature. State mindfulness also increased in their experiment through nature exposure however this was only significant in wild environments, much like the aforementioned effects of well being in wild environments. Such landscapes are much less accessible and therefore reinforce the utility in maximising nature's benefits through mindfulness practice. Indeed meditative awareness can help to magnify the balancing and restorative qualities of nature and nature exposure can in turn improve meditative awareness (Van Gordon et al., 2018). In Howell et al's (2011) first experiment mindfulness was not a significant correlate with nature connection. However in the second experiment the Philadelphia Mindfulness Scale was utilised in addition to the Mindful Attention and Awareness Scale. This, along with a different randomised group of introductory psychology students compared to experiment one resulted in mindfulness correlating in measurement scales which emphasised the awareness dimensions of mindfulness opposed to acceptance. Indicating that the enhanced awareness of nature experiences, rather than non judgmental acceptance of these experiences, may be the associating factor fostering nature connection. Thus in order to optimise

positive experiences within nature an attentive mind may be more important than an accepting mind (Howell et al., 2011).

Contact with natural landscapes can aid in the restoration of attention capability and ease the challenge of becoming present (Passmore & Holder, 2017). This cyclical interaction between mindfulness and nature likely displays an association between particular dimensions of mindfulness and nature connectedness. This is evidenced by a variety of mindfulness measures capturing a relationship with connectedness which varies in its strength depending on the focus of the particular dimensions of the mindfulness scale (Schutte & Malouff, 2018). For example Sadowski et al (2020) found that the non reactivity, observing and describing facets of mindfulness were significantly related to nature relatedness, life satisfaction subjective well being and positive affect. Contrarily the acting with awareness and non judging facets of mindfulness were not significantly related to nature connectedness or negative affect. These findings suggest that when exploring nature connection it is important to consider the role of observing, non reactivity and describing aspects of mindfulness. Both non reactivity and observing in particular had the most profound associations with both well being and connection as they partially mediated the relationship between positive affect and nature connection as well as fully mediating the relationship between life satisfaction and connectedness (Sadowski et al., 2020). Furthermore the relationship between negative affect and nature connection was completely negatively mediated by non reactivity. Consistent with Barbaro and Picket's (2016) findings, greater levels of connectedness leads to less negative affect through decreasing reactivity to experience. In addition, increased connectedness leads to more positive affect, greater subjective well being and life satisfaction through observing and non reactivity facets of mindfulness. Sadowski et al (2020) suggest that the ability to focus and appreciate the occurrence of the present moment allows individuals to attend to environmental stimuli in a more complete manner. Therefore strengthening the connection one feels with nature, consequentially increasing its beneficial effects on well being.

Mindful meditation in a natural setting has been shown to strengthen our connection to nature (Unsworth et al., 2016). The non judgemental awareness and presence that mindful meditation centralises on may be an effective facilitator in increasing one's sense of connection (Schutte & Malouff, 2018). Aspy and Proeve (2017) compared the effects of mindfulness meditation and loving kindness meditation on both social and nature connectedness. Both were found to show significantly higher scores on social and nature connection than the control group who focused on progressive muscle relaxation techniques. Additionally, both social and nature connectedness were positively associated with positive affect yet there was no relationship with negative affect. It is important to note that connectedness scores were not measured prior to the experiment setting, thus limiting their findings to strictly correlation and not causation. However they remain consistent with aforementioned examples demonstrating the beneficial impact of mindfulness and meditation on nature connection and well being. Nisbet et al (2019) also produced a similar result. In their mindful walk in nature experiment participants increased state mindfulness (particularly decentering aspects compared to curiosity), experienced greater connectedness to nature and virtually eradicated their negative moods. Interestingly, these benefits were present regardless of the level of expertise in mindfulness practice prior to the experiment. Suggesting that even those with little to no experience in mindfulness training can with guidance receive benefits from practising in nature. Elucidating the mental state when connecting with nature, particularly through the lens of mindfulness may explain the effects of nature connection on well being through being present in the moment (Sadowski, et al., 2020). Certainly, the relationship between mindfulness and nature is encouraging. Producing reciprocal benefits which extend to that of well being (Tipsord, J. M. 2009).

Overview of the current study

Despite a spike in research over the last few decades there is still a lack of attention and knowledge on the effects that nature connection has on the well being of individuals. Little is known about the role mindfulness plays within this relationship. Furthermore, there is a lot to learn as to why these benefits occur. The current literature has predominantly focused on examining the immediate effects of mindfulness based programs or nature exposure practices within the environment. Consequently little is known as to whether similar effects are present within the general population. This research will evaluate whether there is an association between nature connection, well being and mindfulness amongst Aucklander's as they go about their daily life. Nature experiences are far more accessible than any other therapeutic intervention. The literature to date suggests that nature can be utilised to provide a vast array of benefits. However to my knowledge no research has been conducted within New Zealand.

The current research is a questionnaire survey designed to target the local population and measure the relationship between participants' level of nature connection, hedonic well being, eudemonic well being, stress and mindfulness.

<u>Four hypothesis were tested:</u>

Hypothesis one (H1): Nature connection will be associated with greater eudemonic well being and hedonic well being.

Hypothesis two (H2): Nature connection will be associated with less perceived stress.

Hypothesis three (H3): Nature connection will be associated with greater overall mindfulness, particularly the non reactivity and observing dimensions.

Hypothesis four (H4): Greater time spent in nature will be associated with greater nature connection.

Method

Participants

Participants were recruited via popular social media platform Facebook. A wide range of local community groups and pages across the greater Auckland area were requested to be joined in order to get a strong representation of rural, suburban and urban communities. Sampling consisted of targeting an even number of local communities between Auckland Central, North Shore, South Auckland and eastern suburbs, Pukekohe, West Auckland, and Rodney. Communities from each category were then selected by a random name generator which randomly selected an even amount of towns in each district. A brief overview of the purpose of this research was provided in the group application to outline the motivation behind getting in contact with the local community members. An estimated 25% of attempted applications resulted in failure to join as many community groups require members to be living locally. Following a successful application, a brief mission statement outlining the purpose of this research project was posted on each of the community groups along with a link which took participants directly to the online survey questionnaire. The link opened an information page detailing particulars such as what the study was about, who is doing the research, who can participate, the rights of participants, what is involved in the process and contact information of the researchers.

In order to take part in the research participants were required to be 18 years or over. All members within the Facebook community groups had access to the survey provided they were over the required age. Participants were informed that they would remain anonymous throughout the entirety of the research. Furthermore, participants had the option to request access to the final write up of the project. After a few weeks of recovering survey data it became clear that increasing

the amount of male participants was desirable. Therefore a second post on each of the community groups repeating the exact message as the first accompanied by a request for male participants was completed. All processes and procedures had been evaluated by peer review and judged to be low risk. Informed consent was completed prior to the participants beginning the survey questions.

A total number of 746 participants registered to take part in the online survey questionnaire. Of which 231 failed to achieve 90% completion of the entire questionnaire, 4 were identified as duplicate responses and 3 reported a high fraud score. Those unable to participate included 4 who live outside of New Zealand, 4 under the age of 18 and 6 who did not give consent. A further 22 participants failed to achieve 90% completion on at least one of the five measurement scales. Resulting in a total of 274 participants who met the exclusion criteria. Providing a final sample group of n = 472.

Within the final sample group (n= 472) 17.4% identified as male, 81.1% as female, 1.1% as gender diverse and 0.4% preferred not to say. Those between the ages of 18-25 = 7.4%, 26-35 = 16.7%, 36-45 = 21.2, 46-55 = 25.8%, 56-65 = 17.6% and 65+ = 11.2%. The majority of the group resided in a suburban area (59.5%), followed by rural (30.9%) and then urban (9.3%).

Questionnaire measures

The survey questionnaire consisted of a variety of measurement scales outlining connection to nature, hedonic well being, eudemonic well being, stress and mindfulness. The measurement tools used were the Connectedness to Nature Scale (CNS), Perceived Stress Scale (PSS), Positive and Negative Affect Schedule (PANAS), Meaning in Life Questionnaire (MLQ) and the Five Facet Mindfulness Questionnaire (FFMQ). Additional questions were included to establish demographics

and detail participants' level of exposure to the natural environment. Demographic information was extracted with questions regarding age, gender (optional) and housing location (urban, suburban and rural). Housing location was included to support the evaluation of H4. Perhaps participants living in a rural setting are more exposed to nature than both suburban and urban dwellers. Suburban settings may result in greater exposure to nature than urban settings. In order to quantify participants' level of exposure to nature they were asked to detail their frequency of exposure per month: "*on average, how often do you spend time in nature?".* Further, they were asked: "*how long are these experiences typically?*". Lastly an optional question was posed for participants to briefly describe what these nature experiences were like. Prior to these questions context was provided outlining what a 'nature experience' might entail. Examples were given such as: "*a simple walk in the park, gardening, spending time in a forest, hiking in the mountains or swimming in the ocean etc.*". Developing an understanding of participants' time spent in nature is a critical component in analysing H4. At the end of the survey respondents were given a thank you message as well as an email address to contact should they desire to read the final writings of this research.

Connectedness to Nature Scale

Mayer and Frantz' (2004) Connectedness to Nature Scale (CNS) is designed to measure an individual's affective and experiential sense of oneness with nature. The CNS consists of 14 statements which target specific aspects of the relationship humans share with the environment. Participants are required to respond on a five point likert scale ranging from strongly disagree (1) to strongly agree (5) based on how they generally feel towards each of the 14 statements. Scoring is completed via calculating the mean response, producing a total number between 1 and 5. Scores from 1-2 represent low levels of nature connection while 4-5 indicate high levels of nature connection. Results from the CNS positively correlate with similar measures of nature connection

and environmental attitudes. Additionally, it has high internal consistency (α = 0.84) and high test-retest reliability (Mayer & Frantz, 2004).

Connectedness with nature conceptualises the relationship between humans and the environment. Specifically, the CNS evaluates the degree to which respondents feel a sense of kinship, equality, community, belonging and embeddedness with nature. Therefore facilitating a deeper understanding of our connection with the natural environment. Mayer and Frantz (2004) suggest that an individual's connection to nature as measured by the CNS is trait-like and is predictive of environmental behaviour and subjective well being. Furthermore, this tool can be used to evaluate the effectiveness of environmental sustainability projects, the psychological significance of the human nature relationship as well as the impact of architectural factors designed to increase nature exposure within society.

Perceived Stress Scale

Cohen et al's (1983) Perceived Stress Scale measures the significance to which situations in life are subjectively appraised as stressful. The PSS conceptualises psychological stress to occur when demands exceed resources, impacting the individual's ability to cope. Structured by a 10 item inventory, participants are asked to respond on a five point likert scale ranging from 0 (never) to 4 (very often). Each item addresses the frequency to which specific thoughts and feelings occurred during the last month. Total scores are then calculated via summation, with several of the items requiring reverse coding. Higher scores represent higher levels of perceived stress, contrarily lower scores represent less perceived stress. Higher scores have been associated with failure to quit smoking, failure to control blood sugar levels in diabetics, increased vulnerability to depressive symptoms resulting from stressful life events and more sickness to name a few (Cohen et al., 1983).

Roberti et al (2006) demonstrated a high reliability coefficient for the PSS (α = 0.89). The items were designed to examine individuals' subjective appraisals of how uncontrollable, overloaded and unpredictable their lives are. The PSS simply addresses the level of perceived stress, leaving out the complexity of how and why the individual is experiencing a given level of stress. Thus it is often coupled with additional measurement scales or experiments to evaluate their casual or correlational effect on psychological stress.

Positive and Negative Affect Schedule

The Positive and Negative Affect Schedule is a measurement scale consisting of a variety of words that describe different feelings and emotions distinct to either positive or negative affect. Developed by Wastson, Clark and Tellegen (1998) the PANAS measures both positive and negative affect: the tendency to subjectively experience either positive or negative emotions. The schedule consists of two sets of 10 items. Each dimension respectively describes positive or negative emotions such as ‘enthusiastic’, ‘excited’, ‘irritable’ and ‘guilty’. Participants are required to produce a score ranging from 1 (very slightly or not at all) to 5 (extremely). Indicating the extent to which they generally feel this way, that is, how they tend to feel on average towards each specific item. Total scores range from 10-50 on both the positive and negative sub scales. Higher scores represent greater levels of either positive or negative affect. Watson et al (1998) consider positive and negative affect to be distinct categories of emotion and should therefore be evaluated individually. The PANAS is designed for the researcher to select a time frame to be targeted ranging from present moment to in general. Given the focus of this research the time frame of ‘in general’ was selected and has demonstrated acceptably high reliability scores (α = 0.88 for positive affect and 0.87 for negative affect).

Ryff (1989) considers positive and negative affect to represent distinct categories of emotion. Positive affect refers to the extent to which an individual feels alert, active and enthusiastic. A high score on the positive dimension reflects a state of elevated concentration, increased energy and pleasurable engagement. Contrarily low levels reflect increased lethargy and sadness. Negative affect is generally experienced as subjective distress and unpleasurable engagement. Often represented through a variety of aversive mood states such as contempt, guilt, disgust, fear, anger and nervousness. Low negative affect is often characterised by calmness and serenity. High levels of negative affect are related to increased subjective stress, more health complaints, poorer coping and increased frequency of unpleasant life events. Contrarily high positive affect is related to increased satisfaction with life, greater social activity and increased frequency of pleasurable life events (Watson et al., 1988).

Meaning in Life Questionnaire

The Meaning in Life Questionnaire is a 10 item schedule which evaluates the level of presence and search for meaning in life. Steger et al (2006) developed the measurement to assist individuals in building an understanding of their perceptions of their lives. The items are split into two subscales - presence and search. The presence of meaning subscale is made up of five items specifically tailored to assess how full participants feel their lives are with meaning. The search subscale is made up of five items evaluating how motivated and engaged participants are in efforts to find meaning and deepen their understanding of meaning as it relates to them. For each item respondents are required to produce a score on a seven point likert scale ranging from absolutely untrue to absolutely true. Scores are then summed to provide a total for each subscale, ranging from 5 to 35. Scores above 24 on the presence subscale indicate that the respondent appraises their life to have purpose and valued meaning. Scores above 24 on the search subscale suggest that they are persistently exploring this purpose and meaning. Steger et al (2006) report good internal consistency

for both the presence (α = 0.86) and search (α = 0.92) subscales as well as good convergent and discriminant validity. Presence of meaning is strongly related to increased well being on a wide variety of well being indices. Additionally, meaning is negatively related to both anxiety and depression. The MLQ does not indicate which aspects of life individuals appraise as meaningful. Steger et al (2006) conceptualise meaning in life as the sense and significance felt regarding the nature of an individual's being and existence. As a result no constraints are placed on how meaning in life should be defined. Therefore supporting the notion that each individual constructs their own unique criteria for meaning in life.

Five Facet Mindfulness Questionnaire

Baer et al's (2006) Five Facet Mindfulness Questionnaire is a self scorable and self help measurement tool designed to examine an individual's level of overall mindfulness. More specifically, the FFMQ provides insight into each of the five facets inherently present within mindfulness: observing, describing, acting with awareness, non judgement and non reactivity. The scale is made up of 39 items that relate to experiences, thoughts and actions that occur in everyday life. Each item is tailored to measure one of the five facets of mindfulness. Respondents are required to provide a score that reflects what is 'generally true' for each item on a five point likert scale ranging from never or very rarely true, to very often or always true. Although mindfulness is viewed as a skill that can be developed, the FFMQ measures trait mindfulness which is more stable across time. Summation of the reverse and direct scored items are then calculated for each of the five facets to provide a total score on the respective categories. A total summation is then calculated to provide an overall score, outlining an individual's level of complete mindfulness. Baer et al (2006) report that repeated administration of the FFMQ has demonstrated high test-retest reliability and adequate to good internal consistency for each of the five facets (α = 0.75 non reactivity, 0.83

observing, 0.87 acting with awareness, 0.91 describing and 0.87 non judging). Furthermore, a variety of studies support the validity of the FFMQ through its ability to predict positive well being outcomes and reflect the direct positive correlation between meditation and mindfulness (e.g. Baer et al., 2006; Bohlmeijer et al., 2011). The FFMQ is a multifaceted assessment that evaluates five facets which are thought of as independent skills that each contribute to the overall level of mindfulness.

The FFMQ provides opportunities to empirically investigate the nature of mindfulness and its relationship with additional psychological constructs (Baer et al., 2006). The scale was developed to evaluate the factors that facilitate mindfulness in daily life. Each of the five facets provide unique insight into our inner cognitions. Observing details the application of sensory awareness. Providing insight into how we feel, see and perceive the world. Ultimately contributing to the selection of stimuli that dominates our focus and attention. Describing relates to the way we use words to express our experiences to ourselves and others. Acting with awareness evaluates the actions taken after attending to current stimuli. Identifying the ability to act from fast judgement and steer away from mindless autopilot when responding to a situation. Non judging measures the degree to which an individual's inner critic affects their positive state of mind. Highlighting the importance of unconditional empathy towards the self and others as well as self acceptance. Lastly, non reactivity measures the ability to actively detach from unwanted thoughts and emotions. Calling attention to the importance of accepting their existence and building resiliency towards acting reactively. Therefore fortifying emotional well being and facilitating mental balance. The FFMQ is a valuable tool for measuring the mediating effects of mindfulness in mental health and mindful interventions. Further developing knowledge on the importance of mindfulness in overcoming real life adversity.

Research design

To test the hypotheses regarding nature connection, mindfulness and well being participants were recruited to take part in an online survey questionnaire. Participation entailed responding to five measurement scales benchmarking eudemonic well being, hedonic well being, perceived stress and mindfulness. In addition respondents were required to detail a variety of demographics as well as their average amount of time spent in nature. The survey questionnaire was administered as a singular response, capturing the respondent's average scores on each of the respective measurement scales. Correlational analyses were utilised to measure the relationship between variables.

Procedure

All participants were sent a link to the online survey questionnaire via their respective community groups on Facebook. Once the participants had read through the information page they were required to give consent via ticking a confirmation box on the following page. Participants were then required to provide demographic information pertaining their age, sex and location of residence (rural/urban/suburban). They could then move on to the questionnaire containing the five core measurement scales assessing nature connection, hedonic well being, eudemonic well being, stress and mindfulness. Lastly participants were asked to provide information regarding their average time spent in nature. The questionnaire remained open for two months. Following the completion of the survey participants were thanked for their contributions and given the opportunity to request access to the final publication of research.

Data Analysis

Correlation analysis was used to evaluate whether greater nature connection will lead to increased eudemonic well being and hedonic well being (H1). Correlation was also used to assess whether greater nature connection will result in participants experiencing less perceived stress (H2) and whether greater nature connection will lead to increased overall mindfulness, particularly the non reactivity and observing dimensions (H3). The aforementioned statistical analysis allowed the possibility to determine the probability that the results are due to sampling error (p value), the size of the effects between variables (Pearson's r) and what percent of the variance is explained by the variables in question (r2). In order to assess whether more time spent in nature results in greater nature connection (H4) a one way ANOVA with a Bonferroni post hoc test was used. Thus allowing the ability to measure the differential effects between groups and whether or not the differences are significant. The groups measured ranged from those who had nature experiences on average 0-1 times per month to 10 plus times per month and the average length of these nature experiences ranging from 5-15 minutes to 60 plus minutes.

Results

Hypothesis one

Nature connection will be associated with greater eudemonic well being and hedonic well being.

Correlation analysis was used to understand the relationship between nature connection, eudemonic well being and hedonic well being. The data indicated a significant positive correlation with a small to medium effect size between CNS scores and the PANAS Positive subscale ($p < .01$, $r =$

0.291, r^2 = 0.085), see figure 1. A significant positive correlation with a small to medium effect size was observed between CNS scores and the MLQ ($p < .01$, $r = 0.255$, $r^2 = 0.065$), see figure 2. The data yielded a significant positive correlation with a small to medium effect size between CNS scores and the MLQ Presence subscale ($p < .01$, $r = 0.268$, $r^2 = .072$), see table 2. However the data indicated that the relationship between CNS scores and the PANAS Negative subscale and MLQ Search subscale was insignificant. Table's 1 and 2 summarise these results.

Table 1.Showing results of the correlation and regression analyses of the five measurement scales within the survey questionnaire.

Correlations

		Connectedness to Nature Scale	Five Facet Mindfulness Questionnaire	Perceived Stress Scale	Positive and Negative Affect Scale _ Positive	Positive and Negative Affect Scale _ Negative	Meaning in Life Questionnaire
Connectedness to Nature Scale	Pearson Correlation	1	.301**	-.129**	.291**	-.083	.255**
	Sig. (2-tailed)		<.001	.006	<.001	.080	<.001
	N	472	472	457	448	447	464
Five Facet Mindfulness Questionnaire	Pearson Correlation	.301**	1	-.588**	.583**	-.583**	.186**
	Sig. (2-tailed)	<.001		<.001	<.001	<.001	<.001
	N	472	472	457	448	447	464
Perceived Stress Scale	Pearson Correlation	-.129**	-.588**	1	-.561**	.752**	-.125**
	Sig. (2-tailed)	.006	<.001		<.001	<.001	.008
	N	457	457	457	437	436	452
Positive and Negative Affect Scale _ Positive	Pearson Correlation	.291**	.583**	-.561**	1	-.451**	.332**
	Sig. (2-tailed)	<.001	<.001	<.001		<.001	<.001
	N	448	448	437	448	430	443
Positive and Negative Affect Scale _ Negative	Pearson Correlation	-.083	-.583**	.752**	-.451**	1	-.126**
	Sig. (2-tailed)	.080	<.001	<.001	<.001		.008
	N	447	447	436	430	447	443
Meaning in Life Questionnaire	Pearson Correlation	.255**	.186**	-.125**	.332**	-.126**	1
	Sig. (2-tailed)	<.001	<.001	.008	<.001	.008	
	N	464	464	452	443	443	464

**. Correlation is significant at the 0.01 level (2-tailed).

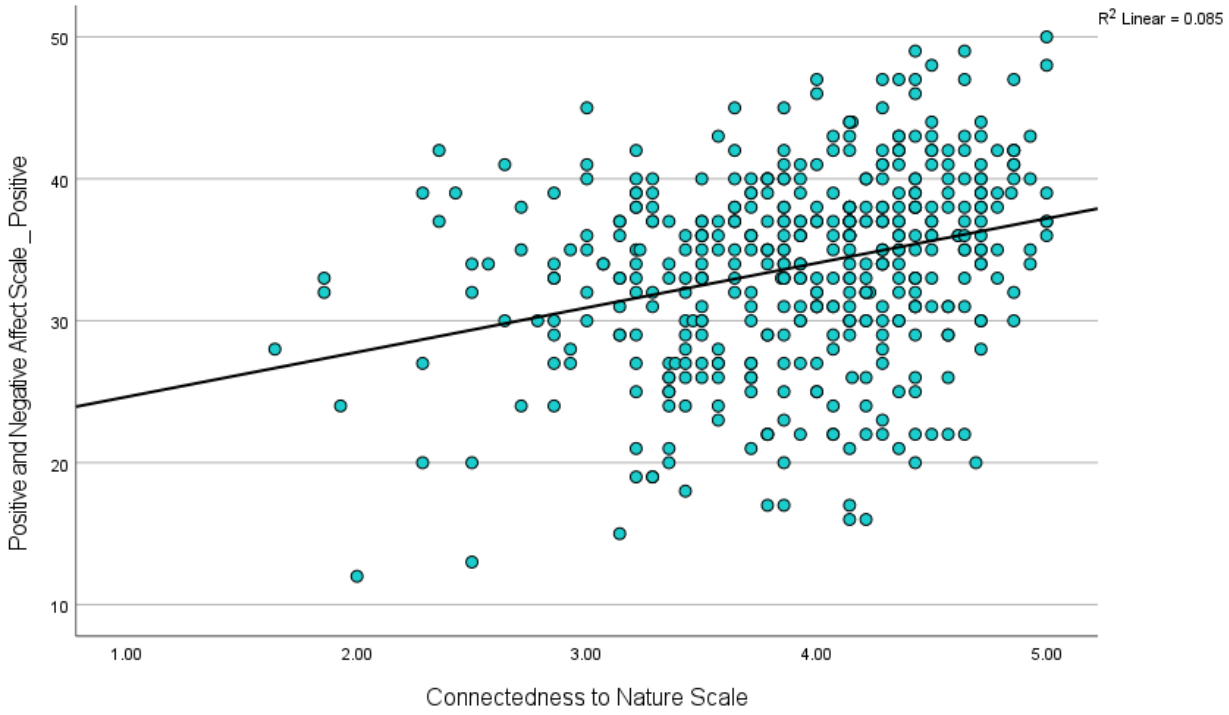

Figure 1. Showing the positive relationship between the connectedness to nature scale and the Positive subscale in the Positive and Negative Affect Schedule for the whole sample.

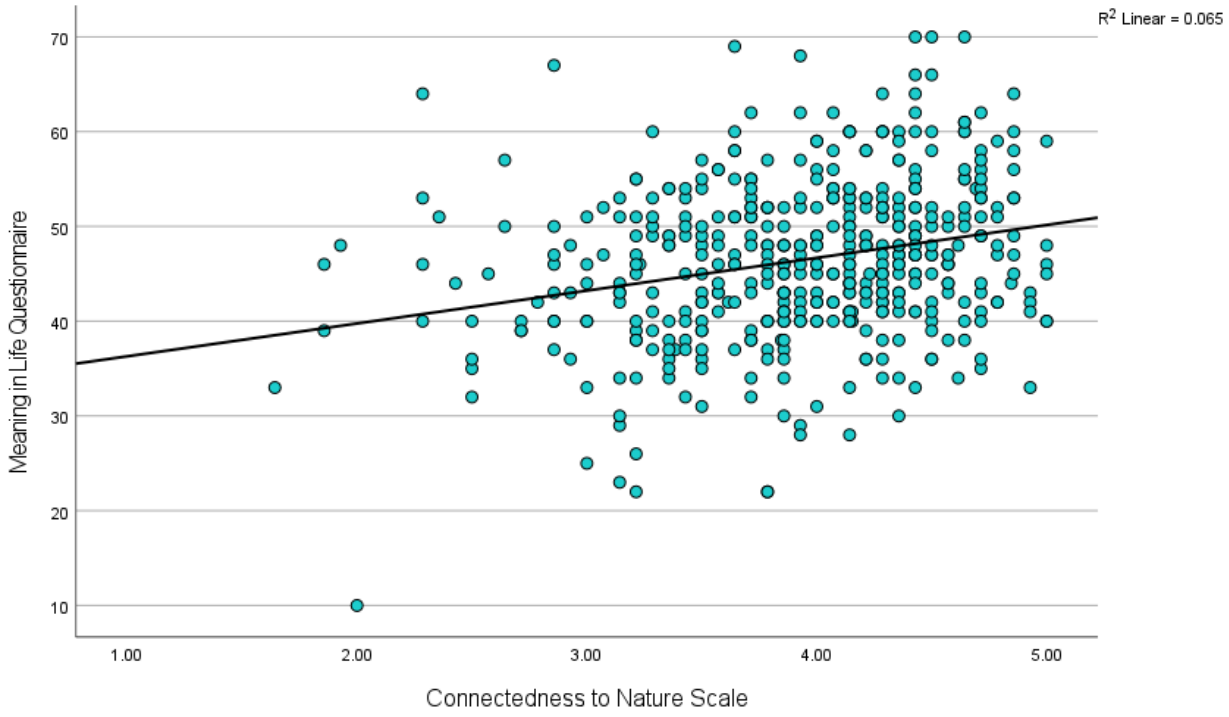

Figure 2. Showing the positive relationship between the connectedness to nature scale and the Meaning in Life Questionnaire for the whole sample.

Hypothesis two

Nature connection will be associated with less perceived stress.

Correlation analysis was used to explore the relationship between nature connection and perceived stress. The data yielded a significant negative correlation of small effect size between CNS scores and the PSS ($p < .01$, $r = -1.29$, $r^2 = .017$), see figure 3. Table 1 summarises these results.

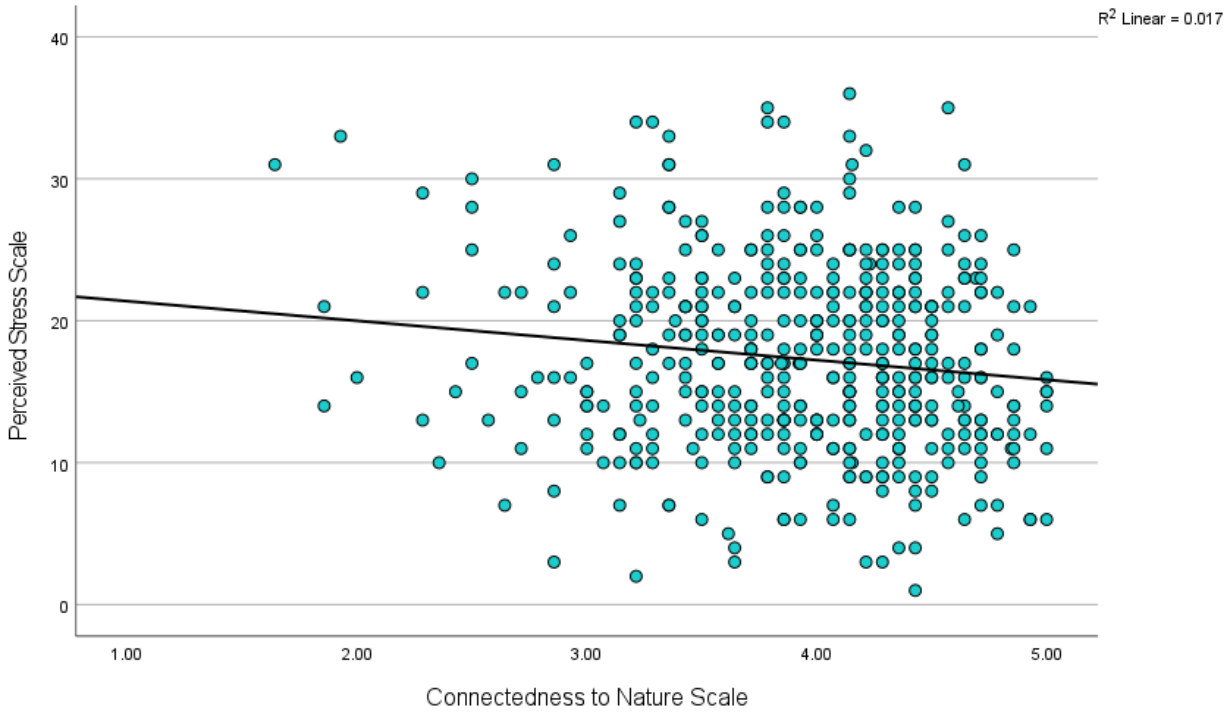

Figure 3. Showing the negative relationship between the connectedness to nature scale and the Perceived Stress Scale for the whole sample.

Hypothesis three

Nature connection will be associated with greater overall mindfulness, particularly the non reactivity and observing dimensions.

Correlation analysis was used to understand the relationship between nature connection and mindfulness as well as each of the five facets of mindfulness as reported in the FFMQ. The data indicated a significant positive correlation of medium effect size between CNS scores and the FFMQ ($p < 0.01$, $r = .301$, $r^2 = .091$), see figure 4. A significant positive correlation of medium effect size was observed between CNS scores and the FFMQ Observing subscale ($p < 0.01$, $r = 0.456$, $r^2 = .208$), see figure 5. A significant positive correlation of small effect size was observed between CNS scores and the FFMQ Non reactivity subscale ($p < 0.01$, $r = .207$, $r^2 = .043$), see figure 6. The data yielded a significant positive correlation of small effect size between CNS scores and the FFMQ Describing subscale ($p < 0.01$, $r = .205$, $r^2 = .042$), see table 2. A significant positive correlation of small effect size was observed between CNS scores and the FFMQ non judging subscale ($p < 0.05$, $r = 0.117$, $r^2 = .014$), see table 2. However the data indicated that the relationship between CNS scores and the FFMQ Awareness subscale was insignificant. Table's 1 and 2 summarise these results.

Table 2. Showing results of the correlation and regression analyses of the Connectedness to Nature Scale and the subscales present in the Meaning in Life Questionnaire and Five Facet Mindfulness Questionnaire.

Correlations - Subscales

		Connectedness to Nature Scale	Meaning in Life Questionnaire _ Presence	Meaning in Life Questionnaire _ Search	Five Facet Mindfulness Questionnaire _ Observing	Five Facet Mindfulness Questionnaire _ Describing	Five Facet Mindfulness Questionnaire _ Awareness	Five Facet Mindfulness Questionnaire _ Non-judging	Five Facet Mindfulness Questionnaire _ Non-reactivity
Connectedness to Nature Scale	Pearson Correlation	1	.268**	.063	.456**	.205**	.079	.117*	.207**
	Sig. (2-tailed)		<.001	.171	<.001	<.001	.089	.013	<.001
	N	472	468	467	461	464	466	455	462
Meaning in Life Questionnaire _ Presence	Pearson Correlation	.268**	1	-.251**	.337**	.457**	.385**	.459**	.467**
	Sig. (2-tailed)	<.001		<.001	<.001	<.001	<.001	<.001	<.001
	N	468	468	464	459	460	462	451	459
Meaning in Life Questionnaire _ Search	Pearson Correlation	.063	-.251**	1	.078	-.162**	-.304**	-.360**	-.147**
	Sig. (2-tailed)	.171	<.001		.098	<.001	<.001	<.001	.002
	N	467	464	467	456	460	461	450	458
Five Facet Mindfulness Questionnaire _ Observing	Pearson Correlation	.456**	.337**	.078	1	.368**	.185**	.129**	.357**
	Sig. (2-tailed)	<.001	<.001	.098		<.001	<.001	.006	<.001
	N	461	459	456	461	453	455	444	452
Five Facet Mindfulness Questionnaire _ Describing	Pearson Correlation	.205**	.457**	-.162**	.368**	1	.323**	.321**	.382**
	Sig. (2-tailed)	<.001	<.001	<.001	<.001		<.001	<.001	<.001
	N	464	460	460	453	464	459	447	455
Five Facet Mindfulness Questionnaire _ Awareness	Pearson Correlation	.079	.385**	-.304**	.185**	.323**	1	.546**	.322**
	Sig. (2-tailed)	.089	<.001	<.001	<.001	<.001		<.001	<.001
	N	466	462	461	455	459	466	451	457
Five Facet Mindfulness Questionnaire _ Non-judging	Pearson Correlation	.117*	.459**	-.360**	.129**	.321**	.546**	1	.483**
	Sig. (2-tailed)	.013	<.001	<.001	.006	<.001	<.001		<.001
	N	455	451	450	444	447	451	455	447
Five Facet Mindfulness Questionnaire _ Non-reactivity	Pearson Correlation	.207**	.467**	-.147**	.357**	.382**	.322**	.483**	1
	Sig. (2-tailed)	<.001	<.001	.002	<.001	<.001	<.001	<.001	
	N	462	459	458	452	455	457	447	462

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

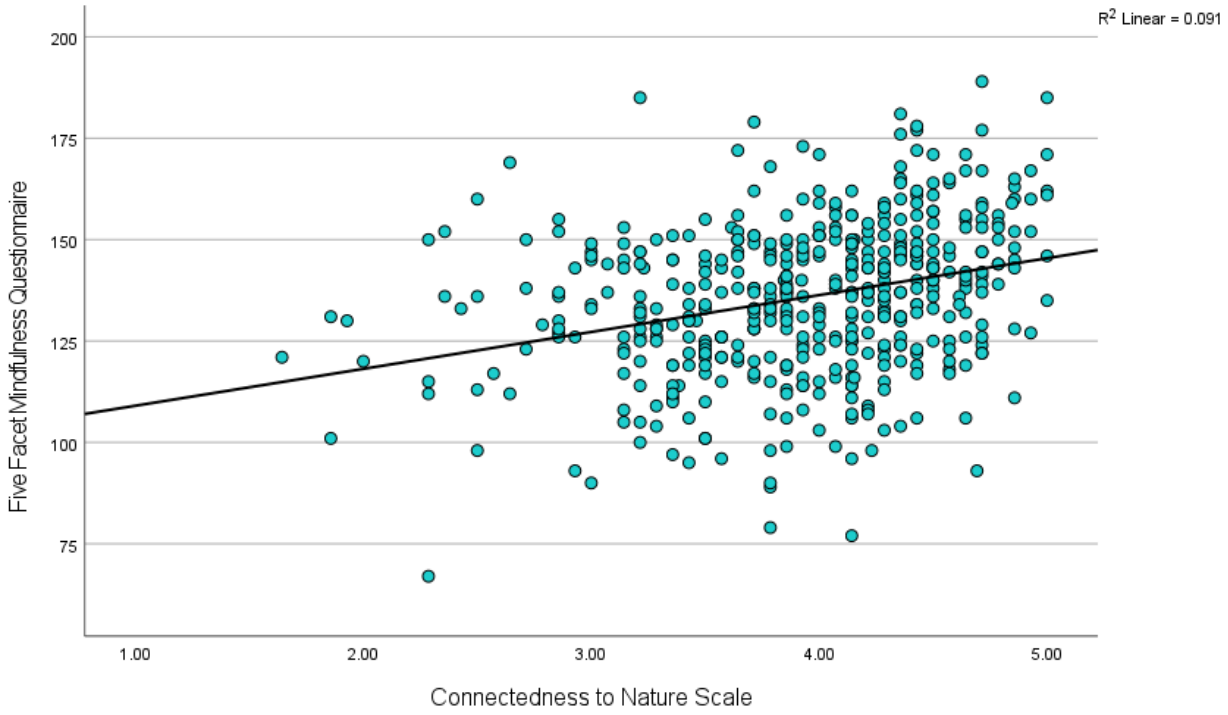

Figure 4. Showing the positive relationship between the connectedness to nature scale and the Five Facet Mindfulness Questionnaire for the whole sample.

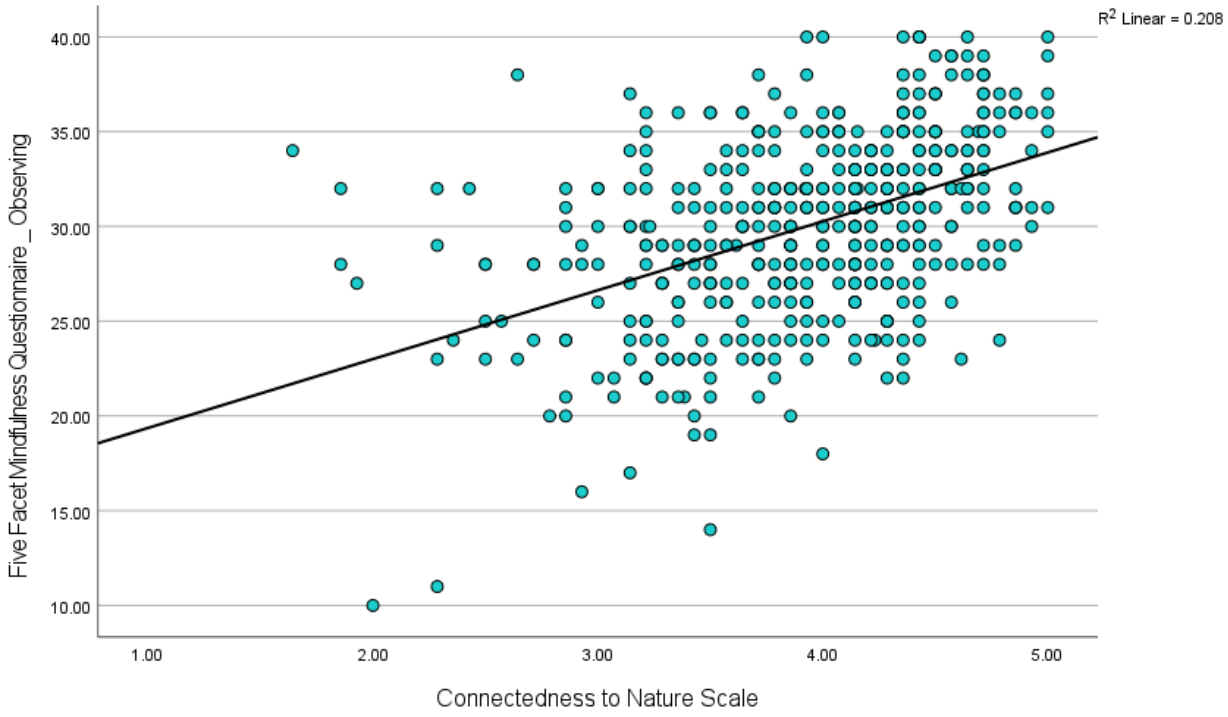

Figure 5. Showing the positive relationship between the connectedness to nature scale and the Observing subscale in the Five Facet Mindfulness Questionnaire for the whole sample.

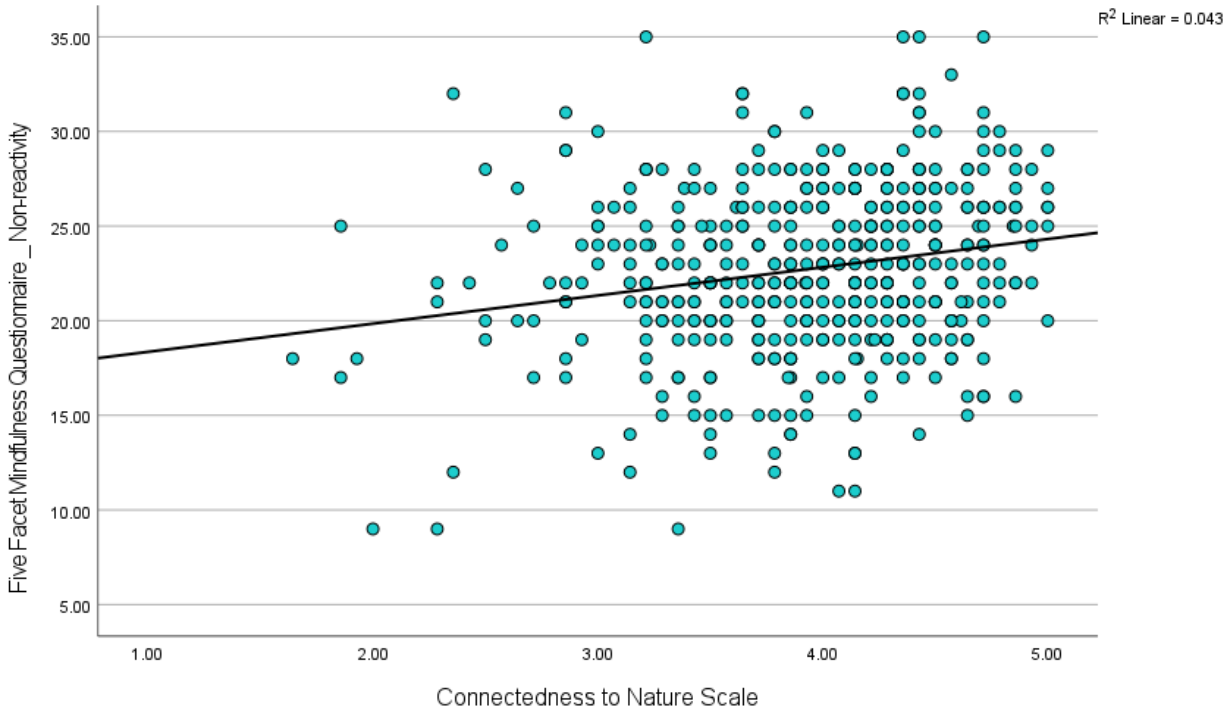

Figure 6. Showing the positive relationship between the connectedness to nature scale and the Non reactivity subscale in the Five Facet Mindfulness Questionnaire for the whole sample.

Hypothesis four

Greater time spent in nature will be associated with greater nature connection.

This hypothesis requires testing whether or not the differences between groups are significant. In the first analysis participants were divided into six groups (group 1: 0-1 times per month; group 2: 2-3 times per month; group 3: 4-5 times per month; group 4: 6-7 times per month; group 5: 8-9 times per month; group 6: 10 plus times per month). The One Way ANOVA results suggest that CNS scores of the groups differ significantly ($F_{5, 466} = 9.829$, $p < .01$). To check for individual differences between groups post hoc comparisons were assessed using Bonferroni correction. The test indicated that the mean score in group 1 (M = 3.07, SD = 0.719) was significantly lower than group 2 (M = 3.73, SD = 0.648), group 3 (M = 3.77, SD = 0.545), group 4 (M = 3.80, SD = 0.653), group 5 (M = 3.76, SD = 0.560) and group 6 (M = 4.03, SD = 0.587) - refer to figure 7. The mean differences were significant at the

0.05 level. However there were no significant differences between groups 2-6. Table 3 summarises these results.

In the second analysis participants were divided into four groups (group 1: 5-15 minutes; group 2: 15-30 minutes; group 3: 30-60 minutes; group 4: 60 plus minutes). The One Way ANOVA results suggest that the CNS scores of the groups differ significantly ($F_{3, 468} = 8.586$, $p < .01$). To check for individual differences between groups post hoc comparisons were assessed using Bonferroni correction. The test indicated that the mean score in group 1 (M = 3.34, SD = 0.788) was significantly lower than group 2 (M = 3.79, SD = 0.578), group 3 (M = 3.96, SD = 0.587) and group 4 (M = 4.02, SD = 0.630) - refer to figure 8. The mean differences were significant at the 0.05 level. Additionally, group 2 scores were significantly lower than group 4 ($p < .05$), see table 4.

The data yielded no significant differences in CNS scores between those who lived in rural, suburban or urban environments.

Table 3. Showing results of the analysis of variance in Connectedness to Nature Scale scores across groups characterised by average times spent in nature per month.

Connectedness to Nature Scale & Nature exposure _ Multiple Comparisons

Dependent Variable: CNS mean

Bonferroni

(I) On average, how often do you spend time in nature?	(J) On average, how often do you spend time in nature?	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
0-1 times per month	2-3 times per month	-.66117*	.19273	.010	-1.2298	-.0925
	4-5 times per month	-.70692*	.18130	.002	-1.2418	-.1720
	6-7 times per month	-.73147*	.18552	.001	-1.2788	-.1841
	8-9 times per month	-.69702*	.19491	.006	-1.2721	-.1220
	10+ times per month	-.96413*	.16265	<.001	-1.4440	-.4842
2-3 times per month	0-1 times per month	.66117*	.19273	.010	.0925	1.2298
	4-5 times per month	-.04575	.13915	1.000	-.4563	.3648
	6-7 times per month	-.07030	.14461	1.000	-.4969	.3563
	8-9 times per month	-.03585	.15647	1.000	-.4975	.4258
	10+ times per month	-.30296	.11379	.120	-.6387	.0328
4-5 times per month	0-1 times per month	.70692*	.18130	.002	.1720	1.2418
	2-3 times per month	.04575	.13915	1.000	-.3648	.4563
	6-7 times per month	-.02455	.12898	1.000	-.4051	.3560
	8-9 times per month	.00990	.14215	1.000	-.4095	.4293
	10+ times per month	-.25721	.09313	.090	-.5320	.0176
6-7 times per month	0-1 times per month	.73147*	.18552	.001	.1841	1.2788
	2-3 times per month	.07030	.14461	1.000	-.3563	.4969
	4-5 times per month	.02455	.12898	1.000	-.3560	.4051
	8-9 times per month	.03446	.14750	1.000	-.4007	.4696
	10+ times per month	-.23265	.10110	.327	-.5309	.0656
8-9 times per month	0-1 times per month	.69702*	.19491	.006	.1220	1.2721
	2-3 times per month	.03585	.15647	1.000	-.4258	.4975
	4-5 times per month	-.00990	.14215	1.000	-.4293	.4095
	6-7 times per month	-.03446	.14750	1.000	-.4696	.4007
	10+ times per month	-.26711	.11744	.351	-.6136	.0794
10+ times per month	0-1 times per month	.96413*	.16265	<.001	.4842	1.4440
	2-3 times per month	.30296	.11379	.120	-.0328	.6387
	4-5 times per month	.25721	.09313	.090	-.0176	.5320
	6-7 times per month	.23265	.10110	.327	-.0656	.5309
	8-9 times per month	.26711	.11744	.351	-.0794	.6136

*. The mean difference is significant at the 0.05 level.

Note: CNS = Connectedness to Nature Scale.

Table 4. Showing results of the analysis of variance in Connectedness to Nature Scale scores across groups characterised by average length of nature experiences.

Connectedness to Nature Scale & Length of exposure _ Multiple Comparisons

Dependent Variable: CNS mean

Bonferroni

(I) How long are these experiences typically?	(J) How long are these experiences typically?	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
5-15 minutes	15-30 minutes	-.45723*	.15635	.022	-.8715	-.0430
	30-60 minutes	-.62241*	.14952	<.001	-1.0186	-.2263
	60 + minutes	-.68470*	.15151	<.001	-1.0861	-.2833
15-30 minutes	5-15 minutes	.45723*	.15635	.022	.0430	.8715
	30-60 minutes	-.16519	.07549	.175	-.3652	.0348
	60 + minutes	-.22748*	.07935	.026	-.4377	-.0172
30-60 minutes	5-15 minutes	.62241*	.14952	<.001	.2263	1.0186
	15-30 minutes	.16519	.07549	.175	-.0348	.3652
	60 + minutes	-.06229	.06486	1.000	-.2341	.1096
60 + minutes	5-15 minutes	.68470*	.15151	<.001	.2833	1.0861
	15-30 minutes	.22748*	.07935	.026	.0172	.4377
	30-60 minutes	.06229	.06486	1.000	-.1096	.2341

*. The mean difference is significant at the 0.05 level.

Note: CNS = Connectedness to Nature Scale.

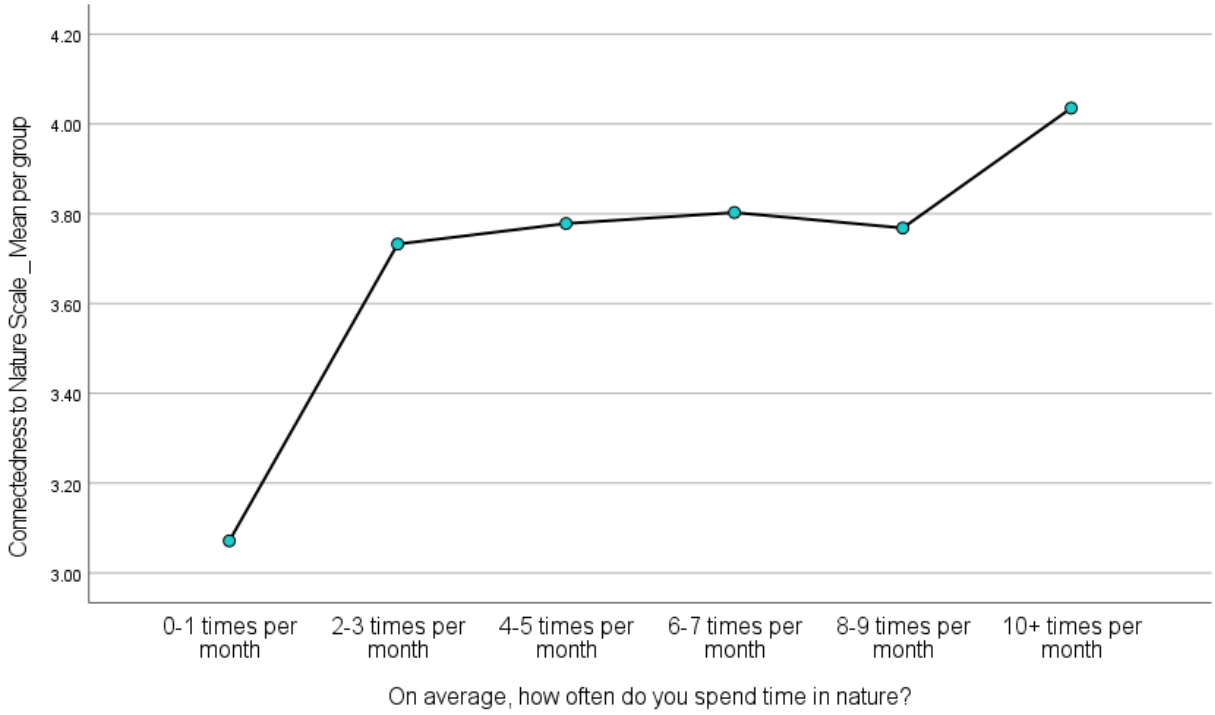

Figure 7. Showing the increase in mean scores on the connectedness to nature scale in groups as they increase in time spent in nature per month for the whole sample.

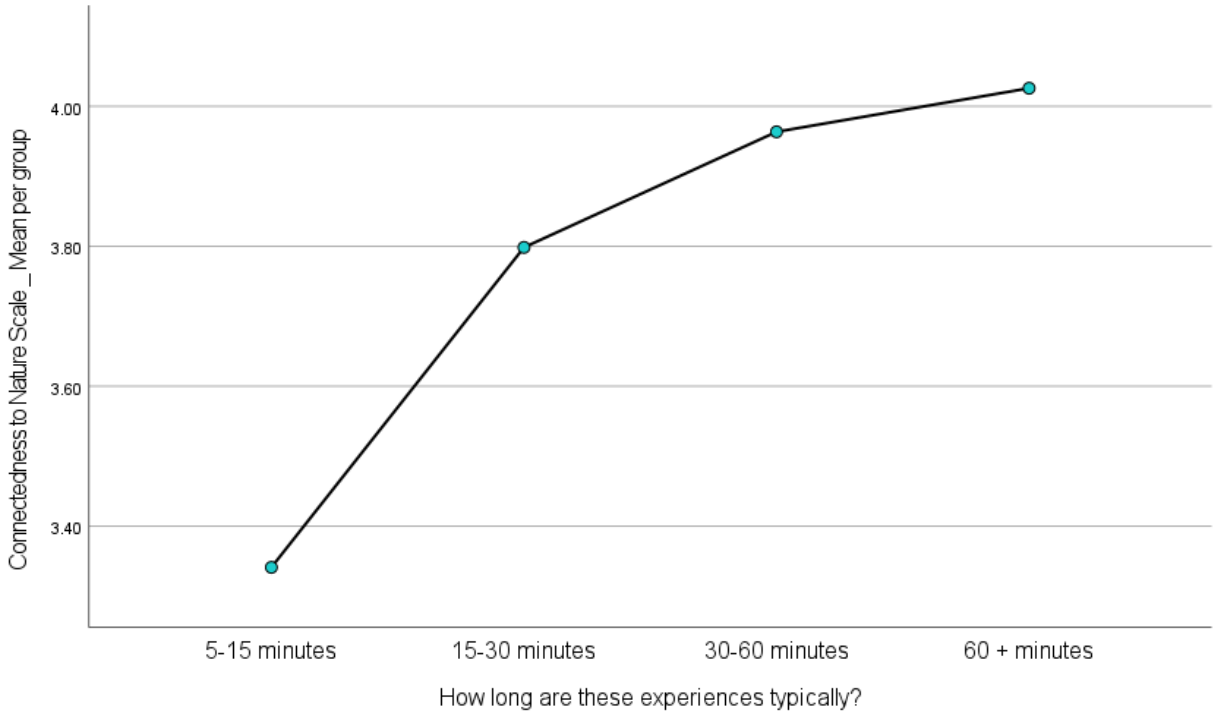

Figure 8. Showing the increase in mean scores on the connectedness to nature scale in groups as they increase in average length of nature experiences for the whole sample.

Demographics

Gender & age

Gender groups were divided into four (group 1: male; group 2: female; group 3: gender diverse; group 4: prefer not to say). Only 5 participants were represented in group 3 and 2 participants in group 4 limiting their statistical power. The One Way ANOVA results suggest that CNS scores of the groups differ significantly ($F_{53,418} = 1.881$, $p < .01$). To check for individual differences between groups post hoc comparisons were assessed using Bonferroni correction. The test indicated that the mean score in group 1 (M = 3.61, SD = 0.730) was significantly lower than group 2 (M = 3.98, SD = 0.604), group 3 (M = 4.21, SD = 0.358) and group 4 (M = 4.50, SD = 0.202), see appendices.

Age categories were divided into six groups (group 1: 18-25; group 2: 26-35; group 3: 36-45; group 4: 46-55; group 5: 56-65; group 6: 65+). The One Way ANOVA results suggest the CNS scores of the groups differ significantly ($F_{5, 466} = 5.522$, $p < .01$). To check for individual differences between groups post hoc comparisons were assessed using Bonferroni correction. The test indicated that the mean score in group 1 (M = 3.48, SD = 0.730) was significantly lower than group 2 (M = 3.86, SD = 0.526), group 3 (M = 4.03, SD = 0.595), group 4 (M = 3.90, SD = 0.650), group 5 (M = 3.96, SD = 0.587) and group 6 (M = 4.10, SD = 0.588). However there was no significant difference between groups 2 and above, see appendices.

Discussion

The data yielded a significant association between CNS scores and the PANAS positive subscale, MLQ and the MLQ presence subscale. However there was no significance in the relationship between CNS scores and the PANAS negative subscale and the MLQ search subscale, therefore partially supporting H1. H2 was supported as CNS scores were associated with lower scores on the PSS. Higher scores on the CNS were associated with an increase in the scores of the FFMQ and the Observing, Describing, Non reactivity and Non judging subscales of the FFMQ. There was no significance found in the relationship between CNS scores and the Acting with awareness subscale of the FFMQ, therefore supporting H3. H4 was supported as CNS scores were significantly higher for participants who spend on average more than 0-1 times in nature per month. Furthermore participants who spend on average 15-60 plus minutes per nature experience scored significantly higher on the CNS than those who averaged 5-15 minutes. The main points of significance within the demographic data are that on average females tended to score slightly higher on the CNS than males. Furthermore, those

above the age group of 18-25 tended to score higher on the CNS on average. Suggesting that there may be some kind of gender and age related effect on participants' level of connection with nature. Although this demographic data falls outside of the focus of this research these findings highlight the importance of further research exploring these effects. It is important to note that this research targeted responses from a general public sample in order to evaluate whether there are benefits from having a strong connection to nature outside of engaging in a nature based therapeutic intervention. The results reflect the experiences of a general public sample within Auckland as they go about their daily life.

Nature Connection and well being

The data partially supported the hypothesis that nature connection will be associated with greater eudemonic well being and hedonic well being (H1). Higher CNS scores were associated with slightly increased positive affect as measured by the PANAS. Additionally, higher CNS scores were associated with slightly increased meaning, particularly presence of meaning captured by the MLQ. However the data indicated that the relationship between CNS scores and negative affect measured via the PANAS was not significant. Furthermore the relationship between CNS scores and the MLQ search subscale was insignificant. Therefore suggesting that nature connection may slightly increase positive aspects of well being such as positive affect and presence of meaning. Yet it may not reduce negative affect or be present in those currently searching for meaning. It is important to note that due to the correlational nature of this research the direction of the relationship between nature connection and well being is uncertain. It could be that greater well being leads people to go out and enjoy nature. Therefore increasing their connectedness to nature.

The results were consistent with previous findings that individuals high in nature connection were more likely to have greater levels of positive affect (e.g. Hamann & Ivtzan, 2016; Nisbet et al., 2010; Nisbet et al., 2019; Sadowski et al., 2020). However unlike these studies nature connection was not associated with lower negative affect. Therefore supporting the notion that having a strong connection with nature likely increases positive dimensions of hedonic well being while contradicting the perception that this connection serves as a buffer against negative affect. Perhaps the relationship between the CNS and negative affect was not observed due to the measurement scales capturing trait based results (PANAS with the 'in general' time frame). After all life is characterised by tragedy and negative affect is inevitable. Nisbet et al (2019) may have observed this relationship due to evaluating state based measures (PANAS with the 'right now' time frame) which captured present moment experiences immediately after their walking in nature experiment. Suggesting that negative affect is reduced in the short term when exposed to nature and that this effect may wane over time.

Hedonic well being is fundamentally based on achieving a balance of reduced or absent negative emotion, positive emotion and having a sense of satisfaction with life (Dagenais-Desmarais & Savoie, 2012). Positive and negative emotion was captured through the PANAS. However satisfaction with life was not measured within this research. It may be that those higher in positive affect are more likely to have increased satisfaction with life. Positive affect is the degree to which a person feels active, alert and enthusiastic (Watson et al., 1988). Participants were asked to respond to the PANAS based on how they generally feel on average. Suggesting that those higher in nature connection more consistently experience positive emotion. It is reasonable to assume that as a result an individual would be more likely to have increased satisfaction with life. However as this was not measured in this research the data cannot support prior findings of the beneficial impact nature connection has on life satisfaction (e.g. Van Gordon et al., 2018). Further research is needed in order to be more confident in this relationship.

It is important to note that although higher scores on the CNS (indicating increased nature connection) were associated with increased positive affect, the effect was small (r = 0.291). Only 8.5% of the increase in positive affect was explained by nature connection (r^2 = 0.085). This appears to be logical as there is a plethora of things that contribute towards experiencing positive affect. Interestingly, both Mayer et al (2009) and Nisbet et al (2019) found that benefits to hedonic well being were most significant and pronounced during direct exposure with nature. For example Nistbet et al (2019) reported an effect size of r = .550 which is significantly higher than the results from this research. Hamann and Ivtzan (2016) found that the increase in positive mood was most significant when participants were exposed to wild areas opposed to urban green spaces. The findings of this research point towards a slight increase in trait positive affect when nature connection is higher. Therefore suggesting that positive affect is not only sustained over time but is likely to spike when engaging with the natural environment, particularly when exposed to wild environments.

A profound criticism of hedonic well being is that it commonly reduces well being to immediately gratifying experiences (Ryff, C, D. 1989). It simply relates to feelings and emotions that are experienced as a result of a particular situation. Eudemonic well being primarily focuses on meaning and growth which is thought to produce a rich, stable and long term state of wellbeing (Bauer et al., 2008; Ryan & Huta, 2008). The results from this study are consistent with prior research suggesting that having a strong connection with nature is associated with more meaningfulness (e.g. Howell et al., 2011; Witt, A. H. D. 2013). Interestingly higher CNS scores were significantly associated with the total summation of the MLQ and the Presence subscale of the MLQ. The relationship between CNS scores and the Search subscale of the MLQ was insignificant, suggesting that nature connection may slightly increase presence of meaning yet it may not be present in those currently searching for meaning. Perhaps those who are more inclined towards searching for meaning in life have less experience with the natural world and therefore have not yet developed a strong connection. The

direction of the relationship is difficult to ascertain given the correlational approach of this research. It may actually be that individuals who are slightly higher in frequency of positive affect, as well as experience greater presence of meaning in life are more likely to go out and experience all that nature has to offer. Nisbet et al (2010) propose a positive feedback loop where those who have a strong connection to nature are more likely to exhibit pro environmental behaviours as well as expose themselves to natural settings which in turn increases their well being and their connection to nature. Regardless of the direction of this relationship there is ample evidence to suggest it exists and is of significant value.

Mayer and Frantz (2004), the developers of the CNS, highlight the depth of meaning associated within the human-nature relationship. Items on the scale explore the degree to which individuals feel they share a common life force with all others that inhabit earth, or the degree to which an individual feels they are a part of a larger cyclical process of living. The data from this research supports the connection between connectedness to nature and meaning. Specifically, 6.5% of the increase in total summation of the MLQ was explained by connectedness to nature ($r^2 = 0.065$). 7.2% of the increase in the Presence subscale of the MLQ was explained by connectedness to nature ($r^2 = .072$). Both of which yielding a small to medium effect size ($r = 0.255$ & $r = 0.268$). Although these figures appear small there is much in life that contributes towards developing a strong sense of meaning. After considering the significant role of relationships, having a meaningful career, giving back to the self, family and community this effect size is rather significant. Furthermore it may be possible to increase this benefit through experiencing wild natural environments (Fredrickson & Anderson, 1999). Although urban greenspaces can provide this effect in smaller doses, suggesting that some nature is better than none at all (Hamann & Ivtzan, 2016). Individual well being tends to thrive when in direct contact with and having a strong sense of connection with the natural environment (Capaldi et al., 2015). Despite the inability to claim a causal effect, the results of this

research are consistent with prior findings which have repeatedly observed the positive effects that nature connection has on both eudemonic and hedonic well being.

The positive well being outcomes associated with nature connection drawn from the data are consistent with both the biophilia hypothesis (Wilson, E. O. 1984) and ecopsychology perspective. Ulrich (1993) suggests that there was a significant advantage for those who acquired and retained positive responses towards natural environments which favoured survival. Therefore humans are predisposed to increase attention and gain liking for particular features that facilitate adaption. If we have an innate tendency to seek affiliation with nature (biophilia) then nature connection should be associated with positive well being outcomes. Furthermore, if human health is considered to be interconnected with the environment and individuals gain meaning from reflective engagement with nature (ecopsychology). There should again be a positive interaction between nature connection and well being, as demonstrated by this research.

Nature connection and stress

The hypothesis that nature connection will be associated with less perceived stress (H2) was supported by the data. Higher CNS scores were associated with slightly lower levels of stress as measured by the PSS. Suggesting that nature connection may lead to slightly less perceived stress. However there is a level of uncertainty of the direction of this relationship due the limitations of correlational analysis. Therefore it is possible that individuals who on average experience less perceived stress may be more inclined to go out into nature, consequently increasing their level of connection.

Given the aforementioned benefits that having a strong connection with and being exposed to nature entails. It is reasonable to assume that those higher in nature connection will most likely

experience less perceived stress. Or at the very least have a greater capacity to deal with stress and are therefore less likely to be negatively impacted by it. The hypothesis that nature connection will be associated with less perceived stress was supported. Remaining consistent with previous research (e.g. Choe et al., 2020; Li, Q. 2018). However it is important to note that prior research primarily focused on the short term impact of stress reduction when in contact with nature. Li's (2018) research is largely influenced by the popular Japanese technique Shinrin Yoku (forest bathing). Contending that when we are in direct contact with nature our stress hormones (cortisol, adrenaline and noradrenaline) are significantly reduced and blood pressure decreases. Furthermore, Choe et al (2020) compared the results of an MBSR programme in those who completed it in a natural setting versus in a built indoor or built outdoor environment. Participants experienced greater reductions in stress in the natural environment setting. The data from this research suggests that individuals higher in connectedness to nature experienced less perceived stress on average. This may be due to the increase in well being facets (positive affect and meaning) apparent in those more strongly connected to nature. As a result individuals may be less likely to experience an imbalance between appraisal of a particular stressor, the demands of the situation and their ability to meet these demands (Lazarus & Folkman, 1987).

The data yielded a small effect size in the reduction of perceived stress in relation to participants' score on the CNS (r = 1.29). Only 1.7% of the reduction in perceived stress was explained by the increase in connectedness to nature (r^2 = .017). Suggesting that most of the benefit in stress reduction is experienced during and shortly after direct exposure (e.g. Li, Q. 2018; Nisbet et al., 2019). Van Gordon et al (2018) proclaim that spending time in nature brings balance to our emotion regulation and nervous system. Producing a calming yet energising experience. It seems that during direct exposure individuals experience this calming effect. However as we exit the natural environment and are reintroduced to daily experiences, stressful life events begin to occur again. Rendering the effect of stress reduction smaller across time. Stressful life events increase the risk of

disease and illness (Cohen et al., 2019). Highlighting the importance of developing a strong connection with nature and utilising natural experiences in such a way that prevents the onset or magnification of disease and illness. The long term benefits of nature connection on perceived stress appear to be small. Therefore the pertinent approach may be to focus on the larger short term benefits in direct exposure while still experiencing a smaller long term benefit. It is important to highlight that when individuals experience perceived danger while in the natural environment the restorative benefits are not accrued (Herzog & Rector, 2008). Further research is needed to establish which types of the natural environment are most likely to reproduce beneficial effects on well being. The direction of the relationship between perceived stress and nature connection cannot be ascertained from this research. It may be that those who experience less perceived stress on average are more likely to engage with nature and to a small degree develop a stronger connection.

Nature connection and mindfulness

Data yielded from the survey questionnaire supported the hypothesis that nature connection will be associated with greater overall mindfulness, particularly the non reactivity and observing dimensions (H3). Higher scores on the CNS were associated with greater overall mindfulness as measured by a total summation of the FFMQ. Additionally, higher CNS scores were associated with greater scores on the Observing subscale of the FFMQ. Higher CNS scores were also associated with greater scores for the Describing, Non reactivity and Non judging subscales of the FFMQ. However the effect sizes were much larger for the overall FFMQ and its Observing subscale. There was no significance in the relationship between CNS scores and the Acting with awareness subscale of the FFMQ. Therefore suggesting that mindful individuals may be more likely to develop a strong connection to nature. Particularly through observing and to a lesser extent through describing, non reactivity and non judging. However, acting with awareness does not appear to have an effect on fostering nature

connection. Again, the direction of these relationships cannot be ascertained with absolute confidence due to the correlational nature of this study. It is entirely possible that nature connection inherently develops skills associated with mindfulness. In this case observing, describing, non reactivity and non judging.

The results from this research are consistent with prior evidence suggesting that individuals higher in trait mindfulness are more likely to feel a stronger sense of connection to nature (e.g. Hamann & Ivtzan, 2016; Howell et al., 2011; Schutte & Malouff, 2018). Furthermore the observing, describing and non reactivity facets of mindfulness as measured by the FFMQ significantly associated with nature connection whereas the acting with awareness dimension was not significantly associated with nature connection (e.g. Sadowski et al., 2020). In contradiction with Sadowski et al (2020) the non judging facet of the FFMQ was significantly associated with nature connection. Suggesting that mindful individuals are more likely to develop a stronger connection to nature and that they may achieve this through skills associated with the observing, describing, non reactivity and non judging facets of mindfulness. Interestingly, both Sadowski et al (2020) and Unsworth et al (2016) proclaim that mindfulness traits are conducive to the positive outcomes that are associated with nature connection. The cyclical nature of this relationship appears logical given the strong focus on continuous attention towards moment to moment experiences that mindfulness entails (Shapiro et al., 2006). Kaplan & Kaplan's (1989) attention restoration theory posits that natural environments can help to restore the capacity for focused attention given our inherent fascination with nature. This, coupled with Wilson's (1984) hypothesis that the brain's functions are tailored towards extracting, processing and critically examining information drawn from the natural environment suggest that the ability to sustain attention moment to moment should be easier when interacting with the natural environment. Consequently enhancing both mindfulness and nature connection, therefore increasing the probability of experiencing positive well being outcomes. Indeed, direct

contact with natural landscapes can facilitate the restoration of attention capability and ease the challenge of becoming present (Passmore & Holder, 2017).

Exploring the benefits that having a strong connection with nature provides instinctively includes establishing an understanding of its interconnection with mindfulness. Mindfulness training, often done through meditation, focuses on developing embodied awareness, emotional balance and clarity. Resulting in improved insight and the ability to overcome suffering (Bodhi, B. 2011). The consistency of this research with others suggests that there are particular aspects of mindfulness which are more associated with the development of nature connectivity. Howell et al (2011) found that enhanced awareness of nature experiences rather than non judgmental acceptance of such experiences was more facilitative in developing a stronger connection with the environment (r = .300 & r = .100). Suggesting that an attentive mind may be more important than an accepting mind when engaging with nature for well being benefits. This research did not find any significance in the relationship between the Acting with awareness facet of the FFMQ and the CNS. Perhaps Howell et al (2011) found a correlation with awareness due to the Philadelphia Mindfulness Scale only having two categories: awareness and acceptance. Awareness in this scale may therefore incorporate many of the qualities attributable to observation, a category of its own within the FFMQ. Observing involves the way in which we use our sensory awareness. How we feel, see, perceive both the internal and external world and select stimuli that sustains our focus and attention. Thus, the ability to focus and bring awareness to the present moment increases the ability for individuals to attend to environmental stimuli (Sadowski et al., 2020). Nisbet et al's (2019) mindful walk in nature experiment produced results supporting this notion. When participants were instructed to be mindful of their surroundings they reported greater levels of connectedness to nature.

The data suggest that the observing facet of mindfulness had the greatest association with nature connection (r = 0.456) and that 20.8% of the increase in CNS scores was attributable to the increase

in observing scores (r^2 = .208). Small effect sizes were observed with both the describing and non reactivity subscales of the FFMQ (r = .205 & r = .207) with 4.2% and 4.3% of the increase in CNS explained by each respective category (r^2 = .042 & r^2 = .043). The smallest effect was found for the non judging dimension of the FFMQ (r = .117) with only 1.4% of the increase in CNS scores attributable to the increase in non judging scores (r^2 = .014). Mindfulness meditation in natural settings has been shown to increase the level of connectedness to nature (Unsworth et al., 2016). Given these results it may be pertinent to strategize the development of a mindfulness practice in nature to prioritise observation qualities of mindfulness, followed by describing, non reactivity and lastly non judging. Interestingly Van Gordon et al's (2018) contemplative mindful river practice incorporates observational qualities which are used as a tool to facilitate the understanding of the law of impermanence. Furthermore, the ecopsychology perspective utilises observational techniques to extract metaphorical examples connecting humans with nature in order to develop learning and growth (Stigsdotter et al., 2011). Although this research suggests this may be an effective strategy further research should examine before and after scores on the measurement scales used in this study after exposing participants to a mindful practice in nature that follows the aforementioned guidelines.

Nature experiences developing connection

The hypothesis that greater time spent in nature will be associated with greater nature connection was supported by the results of this research. 'Time spent in nature' was evaluated two fold: average number of nature experiences per month and average length of these nature experiences. CNS scores differed significantly between groups within both of these categories. More specifically, CNS scores were significantly higher for participants who claimed to have on average more than one nature experience per month (ranging from 3 to 10 plus) than those who claimed to have 0-1 nature experience per month. However there was no significant difference in CNS scores for the groups

ranging from 3 to 10 plus nature experiences per month. Suggesting that in order to significantly increase connectedness to nature individual's should partake in at least 2-3 nature experiences per month. In the second analysis CNS scores were consistent with Hamann and Ivtzan's (2016) finding that those who spend more than 15 minutes in nature experience greater nature connection. Specifically, the data indicated that CNS scores were significantly higher for participants who's nature experiences ranged from 15-60 plus minutes compared to those who spent on average 5-15 minutes per experience. Furthermore CNS scores were significantly higher for participants who spent on average 60 plus minutes per nature experience compared to those who spent 15-30 minutes. Suggesting that in order to maximise connection to nature individual's should aim to spend on average 60 plus minutes per nature experience. However it may be more important to focus on increasing these experiences to above 15 minutes on average as this effect was larger and more feasible to aim for as an individual's time may be limited. The data yielded no significant differences in CNS scores between those who lived in rural, suburban or urban environments.

The results were consistent with previous research suggesting that spending time within the natural environment can bolster subjective nature connectedness (e.g. Davis & Gatersleben, 2013; Mayer et al., 2009; Nisbet et al., 2019). It was hypothesised that as participant's scores increased on both the average number of experiences and length of experiences that scores on the CNS would increase accordingly. Generally speaking the more frequent humans have contact with particular things the more connected we tend to become. Although there are few studies providing evidence for the increase in nature connection as a result of increasing time spent in nature, the hypothesis appeared logical given the amount of research demonstrating the positive outcomes drawn from nature experiences and having a strong connection with nature.

Davis and Gatersleben (2013) suggested that those who are in frequent contact with nature tend to evolve from casual observers into developing a deep connection incorporating awe, fascination and

meaning. Furthermore, Fredrickson and Anderson (1999) found that after spending several days in the wild participants experienced a stronger sense of meaning in life. Participants spoke of the grandiosity of the landscape and awareness of the raw power that nature possesses as facilitators for spiritual inspiration. Such developments are unlikely to occur when spending little time within the natural environment. While our research did not explore the qualities of the evolution from casual observer to deep and meaningful connection. Participants who spent 2-3 or more times experiencing nature per month scored significantly higher on the CNS than those who only spent 0-1. Suggesting that there is a buffering point in which nature connection develops from the casual observer to a deep and meaningful connection incorporating awe and fascination. Further supported by Hamann and Ivtzan's (2016) findings that participants only experienced an increase in meaning if they spent 30 minutes or more in nature per day. There was no significance however in participants who range from 2-10 plus experiences per month. Perhaps time spent in nature only facilitates the development of nature connection to a certain extent. Beyond this other facilitators such as mindfulness practices may be needed to continue the growth.

The data suggests there is no significance in nature connection scores between participants who live in rural, suburban or urban environments. Previous research suggests that people who live in greener environments tend to report better physical and mental health than those more deprived of natural settings in their area of residence (e.g. Nisbet el al., 2010; White et al., 2013). This research did not run statistical analyses on the well being outcomes across housing locations. Perhaps participants in the aforementioned literature who lived in greener environments reported greater physical and mental health regardless of their level of nature connection, although this seems unlikely. Certainly, more research is required to understand in detail exactly what types of nature experiences are more beneficial than others. The results from this research facilitate an understanding of how much time individuals should spend in nature. Based on these findings individuals should aim for at least 2-3 nature experiences per month and these should last on

average longer than 15 minutes, perhaps even beyond 30 and beyond 60 for maximum effect. However, as previously mentioned, some is better than none at all.

Implications

One of the fundamental benefits behind nature connection is that nature exposure, a well demonstrated facilitator for developing connectedness, is free and accessible to everyone. More research is being done exploring the vast array of positive well being outcomes that nature experiences provide. Furthermore, nature connection appears to sustain these benefits to a reasonable degree over the longer term. Developing knowledge on the human-nature relationship will provide motivation for individuals to incorporate nature experiences into their weekly or monthly schedules as a tool for fostering nature connection and increasing well being. Such knowledge provides insight into how individuals can utilise nature exposure in a productive and efficient manner. Life can be busy. Both current and future research could facilitate the development of a range of nature practices that can be tailored towards individuals in a way that suits them. Based on this research for example, someone pressed for time may perhaps spend 15-20 minutes walking in nature 2-3 times per month. Whereas an individual wanting to maximise their connectedness may spend 60 minutes or more per exposure. Indeed, nature exposure is associated with greater nature connection. Both of which are associated with greater well being. Greater well being tends to reduce the risk of a variety of health issues and uplifts quality of life (Steger et al., 2006).

In a similar fashion knowledge drawn from exploring our connection with nature can be utilised to inform professional therapies. The Canadian Mental Health Association is already on board with this notion and has begun training health professionals to run hiking programmes for adults struggling with mental illness. Their 'mood walks' have thus far resulted in increased happiness, energy and decreased anxiety (Hamann & Ivtzan, 2016). The results from this research suggest that in order to maximise nature connection a therapeutic practice should include at least 2-3 sessions per month lasting 60 minutes or more. In addition mindfulness techniques focusing on observation skills could be used to enhance the benefits of the experience. Perhaps the implementation of mindfulness practice in nature might reduce the time required per nature experience while reaching a similar level of connection. After all, mindful practice in nature has been shown to increase the efficiency of experiencing natures benefits (e.g. Nisbet et al., 2019). Furthermore, nature has been shown to increase the benefits of mindfulness in an MBSR course (e.g. Choe et al., 2020).

The research to date provides strong evidence that there is a benefit to nature experiences and developing a connection with nature. However there is much to learn. Further research is required to strengthen our understanding of the relationship between time spent in nature and both nature connection and its association with well being and mindfulness. In addition much can be learnt in regards to particular types of environments that may be more desirable than others as well as what nature experiences should look like. For example: is there a difference between walking by yourself or with a friend; should you avoid listening to music or podcasts; or should you target wild environments over local reserves. Randomised controlled trials examining a variety of experiments targeting different aspects of nature experiences with pre and post measures would facilitate our understanding on the matter. Measurement of short term versus long term effects of these experiments is also desirable as little research has explored the longevity of nature's impact. In addition it is worth considering the findings of Buijs et al (2009) that reflect a preference for natural environments based on prior positive experience in nature as well as cultural norms. If experiences

at a young age are critical for developing connectedness to nature then it is essential that children experience nature in a safe manner. Lastly, nature experience may not have to be physical. Li (2018) found that naturally scented essential oils and sounds of nature produced beneficial effects on well being. Perhaps techniques such as these could be utilised in times where natural environments (e.g. the beach) are not currently accessible.

Perhaps drawing insight into the benefits of nature connection will result in more individuals engaging in environmentally friendly behaviours. Prior research found that increased nature connection was associated with pro nature behaviours (e.g. Hamann & Ivtzan, 2016). Thus, there is potential for providing a motivational force towards nature protection and preservation. Lastly, the evidence suggesting the benefit of exposure to nature may also inform future urban planning projects that could implement little slices of nature within the urban environment. Providing those in more central locations with greater accessibility to natural settings in a balanced manner that does not negatively impact economic development.

Limitations

At the time of data collection Auckland was part way through a significant COVID-19 lockdown. Participants were not allowed to travel unless it was for necessities such as food shopping or undertaking safe recreational activities that were within the local community. Therefore all participants at the time were restricted to the availability of natural environments within their local residential area. There are a variety of ways this may have influenced their responses. Perhaps having less access made people realise just how connected to nature they are and that experiencing deprivation increased their level of appreciation for the environment. Or perhaps participants were

a lot more active in getting out to their local park or beach as it was one of the only activities that could be done outside of the house. COVID was undoubtedly a stressful time for many. Participants' well being scores may have been skewed negatively due to the overwhelming experience of being confined to the household. Overall this was an unusual time and likely influenced the data in a number of complex ways.

A significant limitation of this research is its methodological focus on correlational analysis. Although the data was able to provide evidence of a significant relationship between nature connection, well being and mindfulness, there was no statistical weight in being able to identify the direction of this relationship. The strength of these findings are that nature connection benefits were replicated to a smaller degree in a general population rather than a targeted programme and are likely to be sustained over time. Future research could explore what types of nature experiences the general population engages in and how these influence mindfulness and well being outcomes.

The sample population was significant in size (n = 472) however it was not entirely randomised. Sampling consisted of targeting an even number of local communities between Auckland Central, North Shore, South Auckland and eastern suburbs, Pukekohe, West Auckland, and Rodney. Communities from each category were selected by a random name generator which randomly selected an even amount of towns in each district. These communities were then searched on Facebook and an application was completed to join the group. However, many of the applications were unsuccessful therefore this process continued until there was a reasonable level of representation across the board based on the judgement of the researcher. Therefore subjecting the sample to selection bias. There was also a significant gender imbalance with most participants being female (81.1%). Although there was still a strong representation of males (n = 82). It is unlikely that Facebook users who responded to this survey questionnaire are entirely representative of the Auckland population. Certainly nothing can be said for nature connection in those under the age of

18 as this was not measured. Lastly, Auckland is the most populous city in New Zealand. Future research should explore the effects of nature connection in citizens across the country.

This research did not focus on evaluating the effects of demographics on the relationship between nature connection, mindfulness and well being. Females scored significantly higher on the CNS than males on average. Those above the age group of 18-25 tended to score higher on the CNS on average. Suggesting that there may be demographic influences on nature connectedness. Future research could explore these effects in detail, particularly how they relate to both mindfulness and well being.

Lastly, the methodology did not allow the evaluation of the role Attention Restoration Theory has on the relationship between nature connection, well being and mindfulness. Future research is required focusing on isolated experiments targeting the different facets of attentional experiences within the natural environment. This would provide insight into which particular environments harbour soft fascination and whether or not they produce more significant effects on well being. Mindfulness facets may serve as a great facilitator to developing this knowledge. Findings did however provide some support for the biophilia hypothesis and ecopsychology perspective. Research that critically examines theories behind why nature appears to provide positive well being outcomes is advised.

Conclusion

Overall, this research is supportive of the current body of literature suggesting a significant positive relationship between nature connection, well being and mindfulness. Nature connection was significantly associated with positive affect, overall meaning in life, presence of meaning, less perceived stress, overall mindfulness and the observing, describing, non reactivity and non judgemental facets of mindfulness. Furthermore that time spent in nature was significantly associated with nature connectedness. These effects were present in a general population sample who were not subjected to a targeted nature based therapeutic intervention. Although the direction of these relationships could not be ascertained due to the methodological focus on correlation. The findings from this research when paired with previous literature suggest a cyclical relationship where nature exposure leads to positive well being outcomes and increased nature connection. As a result individuals are more likely to re-engage with nature. In addition, natural environments appear to facilitate mindfulness and mindfulness can be utilised to develop nature connection and experience positive well being outcomes more efficiently. The benefits drawn from nature exposure appear to be most significant in the short term. Though these benefits may foster nature connection and are therefore sustained to a smaller degree in the long term.

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Appendices

Appendix A

Additional graphs & tables

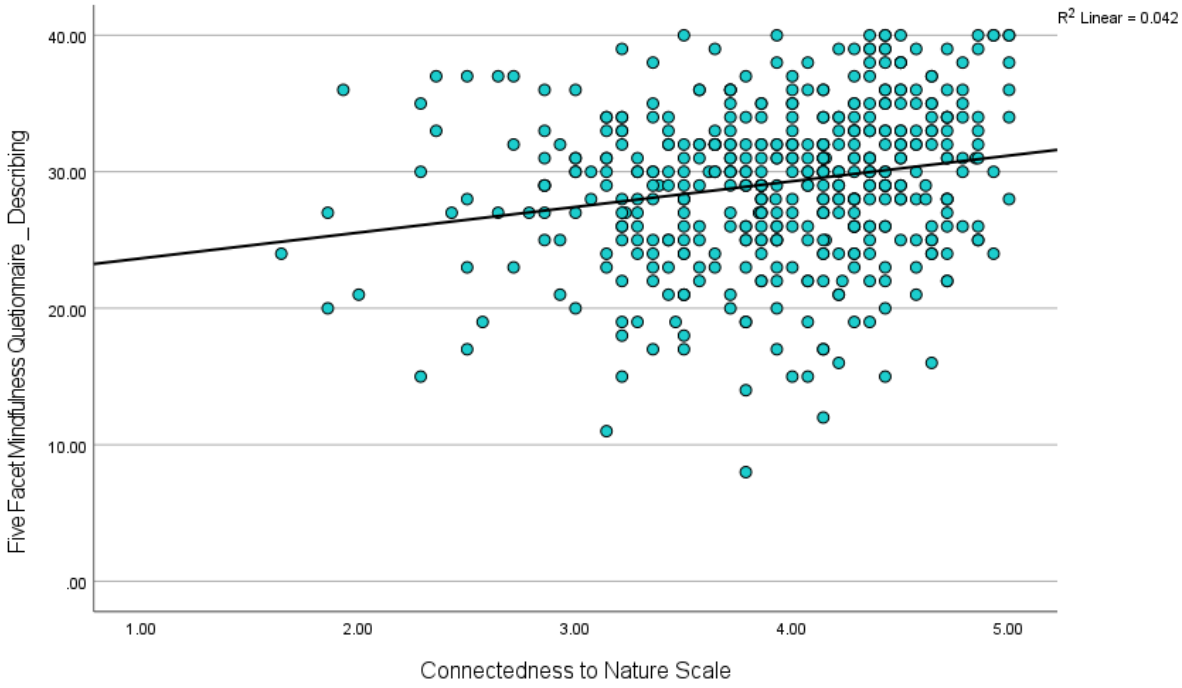

Figure 9. Showing the positive relationship between the connectedness to nature scale and the Describing subscale in the Five Facet Mindfulness Questionnaire for the whole sample.

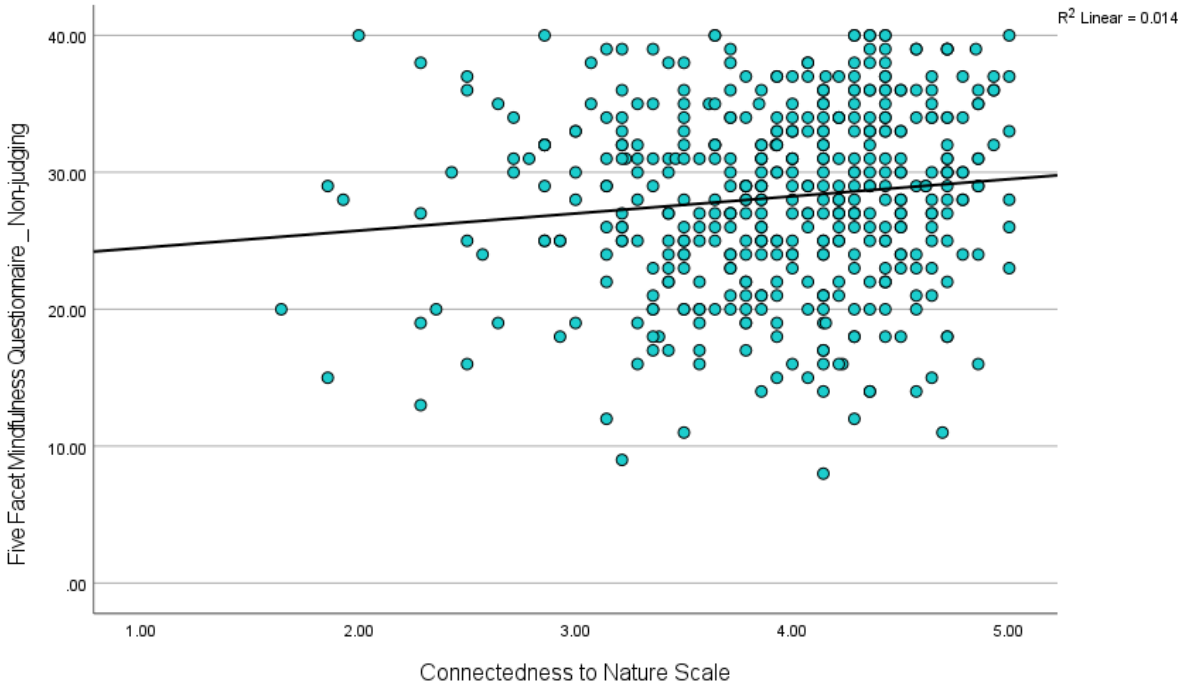

Figure 10. Showing the positive relationship between the connectedness to nature scale and the Non judging subscale in the Five Facet Mindfulness Questionnaire for the whole sample.

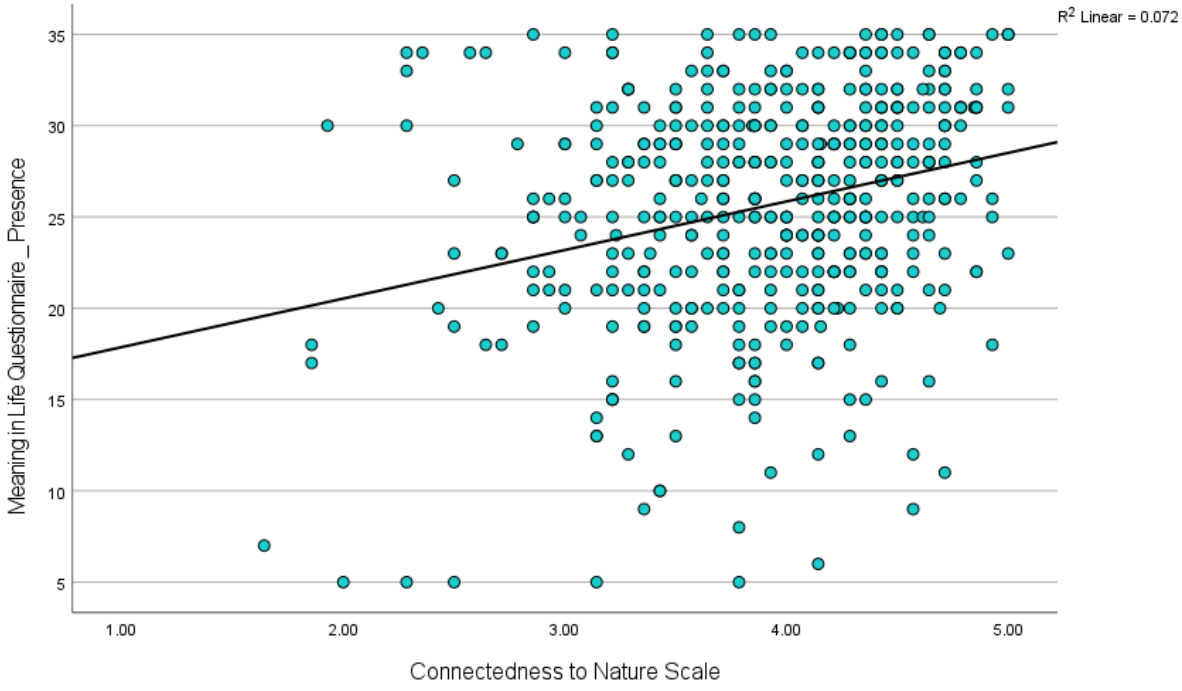

Figure 11. Showing the positive relationship between the connectedness to nature scale and the Presence subscale in the Meaning in Life Questionnaire for the whole sample.

Connectedness to Nature Scale

CNS mean

Age	Mean	Std. Deviation	N
18-25 years	3.4819	.73024	35
26-35 years	3.8689	.52626	79
36-45 years	4.0318	.59597	100
46-55 years	3.9025	.65084	122
56-65 years	3.9645	.58739	83
65+ years	4.1076	.58828	53
Total	3.9270	.62274	472

Table 5. Showing the mean scores on the Connectedness to Nature Scale for each age group category.

Connectedness to Nature Scale

CNS mean

What is your gender? - Selected Choice	Mean	Std. Deviation	N
Male	3.6110	.62702	82
Female	3.9880	.60447	383
Gender diverse (please specify)	4.2132	.35825	5
Prefer not to say	4.5000	.20203	2
Total	3.9270	.62274	472

Table 6. Showing the mean scores on the Connectedness to Nature Scale for each gender category.

Appendix B

Information sheet

Nature connection and its relationship with mindfulness and well-being.

Information Sheet

We would greatly appreciate your contribution towards this important research.

What is the study about?
Our connection with nature is a phenomena highly valued by many, yet appears to be challenged as a consequence of the development of society. Current research suggests that spending time in nature has a wide variety of benefits to our well-being and can be used therapeutically. This research project aims to examine the relationship between nature connection, well-being and mindfulness across a broad population within New Zealand.

Who is doing this research?
My name is Robbie Capizzi and I am a Masters student in Arts (Psychology) at Massey University being supervised by Dr Heather Kempton.

Who can participate?
You need to be 18 years or older to participate. We are interested in responses from a very broad range of people across New Zealand. If you agree to participate you will be asked to complete this survey questionnaire.

Your rights as a participant:
You are under no obligation to accept this invitation. If you decide to participate, completion and submission of the questionnaire implies consent. You have the right to decline to answer any particular question. In order to protect your privacy the survey is anonymous.

Data resulting from this research will be securely stored at Massey University for 5 years, after which it will be destroyed. The information you provide will be used in my Masters thesis and submitted for assessment and the findings may be published in scientific journals or presented at scientific conferences in New Zealand and overseas.

What is involved?
Completing this survey will take approximately 15 minutes. Your responses will contribute to research designed to further understand the relationship between nature connection, mindfulness and well-being.

When filling out this survey please respond honestly, accurately and to the best of your ability.

To start the survey, click on the "**Next**" button at the bottom of this page. Thank you for giving your valued time towards completing this survey.

Contact information
If you have any questions or queries regarding this project, please don't hesitate to contact the following:

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This research project has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethics Committees. The researcher(s) named above are responsible for the ethical conduct of this research.

If you have any concerns about the conduct of this research that you wish to raise with someone other than the researcher(s), please contact Professor Craig Johnson, Director (Research Ethics),
telephone 06 3569099 ext 85271, email humanethics@massey.ac.nz.

Respondent Consent

Thank you for participating in this questionnaire.
Your participation implies consent.
You have the right to decline to answer any particular question.
I have read and understood the information sheet for this study and consent to collection of my responses.
(Please click on the 'Yes' choice if you wish to proceed.)

Appendix C

Connected to Nature Scale

Please answer each of these questions in terms of *the way you generally feel*. There are no right or wrong answers. Using the following scale, simply state as honestly and candidly as you can what you are presently experiencing.

1 2 3 4 5

Strongly disagree Neutral Strongly agree

____1. I often feel a sense of oneness with the natural world around me.

____2. I think of the natural world as a community to which I belong.

____3. I recognize and appreciate the intelligence of other living organisms.

____4. I often feel disconnected from nature.

____5. When I think of my life, I imagine myself to be part of a larger cyclical process of living.

____6. I often feel a kinship with animals and plants.

____7. I feel as though I belong to the Earth as equally as it belongs to me.

____8. I have a deep understanding of how my actions affect the natural world.

____9. I often feel part of the web of life.

____10. I feel that all inhabitants of Earth, human, and nonhuman, share a common 'life force'.

____11. Like a tree can be part of a forest, I feel embedded within the broader natural world.

____12. When I think of my place on Earth, I consider myself to be a top member of a hierarchy that exists in nature.

____13. I often feel like I am only a small part of the natural world around me, and that I am no more important than the grass on the ground or the birds in the trees.

____14. My personal welfare is independent of the welfare of the natural world.

Appendix D

Perceived Stress Scale

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate how often you felt or thought a certain way.

0 = Never, 1 = Almost Never, 2 = Sometimes, 3 = Fairly Often, 4 = Very Often

1. In the last month, how often have you been upset because of something that happened unexpectedly? 0 1 2 3 4

2. In the last month, how often have you felt that you were unable to control the important things in your life? 0 1 2 3 4

3. In the last month, how often have you felt nervous and "stressed"? 0 1 2 3 4

4. In the last month, how often have you felt confident about your ability to handle your personal problems? 0 1 2 3 4 5.

5. In the last month, how often have you felt that things were going your way? 0 1 2 3 4

6. In the last month, how often have you found that you could not cope with all the things that you had to do? 0 1 2 3 4

7. In the last month, how often have you been able to control irritations in your life? 0 1 2 3 4

8. In the last month, how often have you felt that you were on top of things? 0 1 2 3 4

9. In the last month, how often have you been angered because of things that were outside of your control? 0 1 2 3 4

10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them? 0 1 2 3 4

Appendix E

Positive and Negative Affect Schedule

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you generally feel this way, that is, how you feel on average. Use the following scale to record your answers.

1= very slightly or not at all, 2= a little, 3= moderately, 4= quite a bit, 5= extremely

Interested__

Distressed__

Excited__

Upset__

Strong__

Guilty__

Scared__

Hostile__

Enthusiastic__

Proud__

Irritable__

Alert__

Ashamed__

Inspired__

Nervous__

Determined__

Attentive__

Jittery__

Active__

Afraid

Appendix F

Meaning in Life Questionnaire

Please take a moment to think about what makes your life feel important to you. Please respond to the following statements as truthfully and accurately as you can, and also please remember that these are very subjective questions and that there are no right or wrong answers. Please answer according to the scale below:

1= Absolutely untrue, 2= Mostly untrue, 3= Somewhat untrue, 4= Can't say true or false, 5= Somewhat true, 6= Mostly true, 7= Absolutely true

1. I understand my life's meaning.
2. I am looking for something that makes my life feel meaningful.
3. I am always looking to find my life's purpose.
4. My life has a clear sense of purpose.
5. I have a good sense of what makes my life meaningful.
6. I have discovered a satisfying life purpose.
7. I am always searching for something that makes my life feel significant.
8. I am seeking a purpose or mission for my life.
9. My life has no clear purpose.
10. I am searching for meaning in my life.

Appendix G

Five Facet Mindfulness Questionnaire

Please rate each of the following statements with the number that best describes your own opinion of what is generally true for you.

Please rate each of the following statements with the number that best describes *your own opinion* of what is *generally true for you.*		Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
FFQM 1	When I'm walking, I deliberately notice the sensations of my body moving. (OBS)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 2	I'm good at finding words to describe my feelings. (D)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 3	I criticize myself for having irrational or inappropriate emotions. (NJ-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 4	I perceive my feelings and emotions without having to react to them. (NR)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 5	When I do things, my mind wanders off and I'm easily distracted. (AA-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 6	When I take a shower or bath, I stay alert to the sensations of water on my body. (OBS)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 7	I can easily put my beliefs, opinions, and expectations into words. (D)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 8	I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted. (AA-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 9	I watch my feelings without getting lost in them. (NR)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 10	I tell myself I shouldn't be feeling the way I'm feeling. (NJ-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 11	I notice how foods and drinks affect my thoughts, bodily sensations, and emotions. (OBS)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 12	It's hard for me to find the words to describe what I'm thinking. (D-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 13	I am easily distracted. (AA-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 14	I believe some of my thoughts are abnormal or bad and I shouldn't think that way. (NJ-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 15	I pay attention to sensations, such as the wind in my hair or sun on my face. (OBS)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 16	I have trouble thinking of the right words to express how I feel about things. (D-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 17	I make judgments about whether my thoughts are good or bad. (NJ-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 18	I find it difficult to stay focused on what's happening in the present. (AA-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1

		Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
FFQM 18	When I have distressing thoughts or images, I "step back" and am aware of the thought or image without getting taken over by it. (NR)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 20	I pay attention to sounds, such as clocks ticking, birds chirping, or cars passing. (OBS)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 21	In difficult situations, I can pause without immediately reacting. (NR)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 22	When I have a sensation in my body, it's difficult for me to describe it because I can't find the right words. (D-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 23	It seems I am "running on automatic" without much awareness of what I'm doing. (AA-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 24	When I have distressing thoughts or images, I feel calm soon after. (NR)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 25	I tell myself that I shouldn't be thinking the way I'm thinking. (NJ-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 26	I notice the smells and aromas of things. (OBS)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 27	Even when I'm feeling terribly upset, I can find a way to put it into words. (D)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 28	I rush through activities without being really attentive to them. (AA-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 29	When I have distressing thoughts or images, I am able just to notice them without reacting. (NR)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 30	I think some of my emotions are bad or inappropriate and I shouldn't feel them. (NJ-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 31	I notice visual elements in art or nature, such as colors, shapes, textures, or patterns of light and shadow. (OBS)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 32	My natural tendency is to put my experiences into words. (D)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 33	When I have distressing thoughts or images, I just notice them and let them go. (NR)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 34	I do jobs or tasks automatically without being aware of what I'm doing. (AA-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 35	When I have distressing thoughts or images, I judge myself as good or bad depending what the thought or image is about. (NJ-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 36	I pay attention to how my emotions affect my thoughts and behavior. OBS)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

		Never or very rarely true	Rarely true	Sometimes true	Often true	Very often or always true
FFQM 37	I can usually describe how I feel at the moment in considerable detail. (D)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
FFQM 38	I find myself doing things without paying attention. (AA-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
FFQM 39	I disapprove of myself when I have irrational ideas. (NJ-R)	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1

Scoring:
(Note: R = reverse-scored item)

Subscale Directions	Your Score TOTAL	Your score item Avg.
Observing: Sum items 1 + 6 + 11 + 15 + 20 + 26 + 31 + 36		
Describing: Sum items 2 + 7 + 12R + 16R + 22R + 27 + 32 + 37.		
Acting with Awareness: Sum items 5R + 8R + 13R + 18R + 23R + 28R + 34R + 38R.		
Nonjudging of inner experience: Sum items 3R + 10R + 14R + 17R + 25R + 30R + 35R + 39R.		
Nonreactivity to inner experience: Sum items 4 + 9 + 19 + 21 + 24 + 29 + 33.		
TOTAL FFMQ (add subscale scores)		

NOTE: Some researchers divide the total in each category by the number of items in that category to get an average category score. The Total FFMQ can be divided by 39 to get an average item score.

Appendix H

Questions

Below are a few questions outlining what your experiences with nature typically look like. These experiences can range from a simple walk in the park, gardening, spending time in a forest, hiking in the mountains or swimming in the ocean etc.

On average, how often do you spend time in nature? (0-1 times per month, 2-3 times per month, 4-5 times per month, 6-7 times per month, 8-9 times per month, 10+ times per month).

How long are these experiences typically? (5-15 minutes, 15-30 minutes, 30-60 minutes, 60 + minutes).

Briefly describe what these experiences are like (e.g. Are you by yourself? Do you walk in the park/forest? Are you listening to music at the same time etc.).

Appendix I

Thank you message

Thank you for giving your valued time towards filling out this survey.

Your contribution will help to further understand the relationship between nature connection, well-being and mindfulness and will hopefully provide a platform for New Zealand researchers to explore from.

If you wish to read the final publication patiently await until March 2022 and send an email to Natureconnection3@gmail.com requesting access.