Investigating Green Space and Wellbeing:

Piloting a Wellbeing Assessment Tool

and

Development of a Green Space at an NHS Hospital Site

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Summary

Green spaces have been shown to have a positive impact on health and wellbeing. However, research suggests that measurements of green space and wellbeing are not standardised meaning it is difficult to compare between studies. This thesis presents two aims: to design a quantifiable and repeatable tool to assess wellbeing in relation to green spaces evaluated with Cardiff University staff and to create a green space for NHS staff wellbeing at an NHS hospital site.

The tool was designed to include a combination of wellbeing and green space measures. This was evaluated through an iterative process of a 2-phase pilot study. The tool was delivered through an online survey and collected feedback on each data section.

The phase-1 pilot study utilised a mixed-methods approach to longitudinally evaluate the first tool iteration. Cardiff University staff provided feedback on the tool through open text boxes (n=10 for the preliminary survey and n=11 for the main survey) and in semi-structured interviews (n=2). Data was analysed through content and thematic analyses which informed tool changes and recommendations for the next phase.

In phase-2, Cardiff University staff and postgraduate students (n=32) evaluated the second tool iteration through a cross-sectional study design. A content analysis of feedback informed the final tool iteration design, suggesting recommendations for practical research methodology in further studies.

A successful collaboration with staff at Ysbyty Ystrad Fawr, NHS hospital in Caerphilly developed an onsite rewilded green space for wellbeing. The results from this intervention involved an observed increase in biodiversity and community online engagement through online social media posts. Reflections on the green space development, usage and future were collected from semi-structured interviews with NHS staff project collaborators (n=2). This co-production approach between the researcher and NHS staff had resulted in a follow up project to further develop the green space biodiversity, community engagement and provides project legacy.

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Chapter 1 Introduction

1.1 Introduction to Research Context

A growing body of research suggests that spending time in nature and green spaces is beneficial for wellbeing (Bowler et al., 2010). General wellbeing measured in the context of green space is an important public health evaluation as it can inform local services and public health practices such as green prescribing services and influence national policymaking to improve the health of the nation. The research into this topic is ever-expanding and many different measurements have been used for evaluation which results in no single standardised tool or uniformity of scale to measure subjective wellbeing in relation to spending time in green space. This current pilot study aims to design and evaluate a unique tool to analyse the relationship between wellbeing and green space, whilst simultaneously designing a wellbeing green space at an NHS hospital site as a location to utilise the tool.

1.2 Literature Review and Topic Background

1.2.1 Research into Wellbeing

Wellbeing is a ubiquitous term the definition of which has been historically debated. World Health Organization (WHO) defines wellbeing as 'the realization of one's physical, emotional, social, mental and spiritual potential' (Misselbrook, 2014; World Health Organization, 1998). Due to recent economic, public policy and health interest in the term 'wellbeing' a modern comprehensive definition has been suggested: 'stable wellbeing is when individuals have the psychological, social and physical resources they need to meet a particular psychological, social and/or physical challenge' (Dodge et al., 2012). This definition suggests that there is a balance between resources and challenges that is defined by the individual.

The subjective nature of wellbeing leads to much debate in how to measure and compare wellbeing both on the personal and societal levels. 'National wellbeing' is considered a multi-dimensional concept, (Tinkler & Hicks, 2011) consisting of two factions, objective wellbeing and subjective wellbeing.

Objective wellbeing assumes what is required for individuals and defines when those requirements are satisfied. For example, economic income, quality of life and environment quality (Selwyn & Riley,

2015). Although assumptions of wellbeing can be drawn for large populations with objective measures, only by asking individuals themselves, will a true measure of wellbeing be gained.

Subjective wellbeing (SWB) is defined as a person's 'cognitive and affective evaluations of his or her life' (Diener et al., 2015), this accounts for short term moods and long-term judgements of how a person's life is proceeding. Perceptions are vital in subjective measures as this assessment of wellbeing is collected through questions asking a person to rate how they feel. Selwyn and Riley (2015) describe three different approaches to measuring SWB, the evaluative approach, the experience and the eudemonic approach (defined below) (Campbell, 1976). The evaluative approach assesses overall life satisfaction, often reflective on the last week or two, using Likert scales (Norman, 2010), such as the Office of National Statistics Personal wellbeing questions (Tinkler & Hicks, 2011). The experience approach addresses the individual's affect, defined as emotional quality of life in terms of positive and negative emotions. This approach also uses reflective methods such as diary or day reconstruction methods (Tinkler & Hicks, 2011). The frequency of positive and negative emotions can be evaluated and scored with measures such as the Positive and Negative Affect scale (Egloff et al., 2003). The eudemonic approach is an individual's assessment of their internal world measuring 'flourishing' characteristics, this is defined as whether the individual is thriving or living optimally (Durden-Myers et al., 2018) which relate to high levels of wellbeing and coping with stress (Dodge et al., 2012; Hone et al., 2014; McDowell, 2010).

Subjective wellbeing can be assessed in any of these three ways utilising the range of tools that have been created to assess the subjective experience of an individual's wellbeing. However, the nature of the measure is that it is subjective in itself. What is good wellbeing for one person may not count as good wellbeing for another person making wellbeing questionnaire responses difficult to compare and to label. The complexity of these measurements is much debated (Brulé & Maggino, 2017), however, by validating tools with studies and maintaining awareness of this complex interaction between objective measures and subjective wellbeing, research into wellbeing can evaluate a population to inform services.

1.2.2 The Importance of Research into Wellbeing

Research concerning SWB is becoming increasingly important as, in 2010, the UK Government began monitoring national levels of wellbeing as an indicator of national progress alongside traditional measures such as Gross domestic product (GDP) (Waldron, 2010). Workplace wellbeing has been linked with the number of stress-related symptoms leading to increased sick days (Danna & Griffin, 1999) and high levels of wellbeing help people adapt to circumstances with resilience qualities (Diener

et al., 2017). The Office for National Statistics measures subjective wellbeing to inform public policy (Dolan et al., 2011b; Dolan & Metcalfe, 2011, 2012) and this work has highlighted the importance of areas previously unmeasured, such as community feel, and a sense of belonging and trust (Tinkler & Hicks, 2011).

Measuring wellbeing and specifically subjective wellbeing is important as a social indicator informing public policy (Cummins, 2018; Dolan & Metcalfe, 2011); and as means of determining the effectiveness of wellbeing interventions (Adler & Seligman, 2016) such as engaging with green spaces (Lee et al., 2015).

1.2.3 The Impact of Green Space on Health and Wellbeing

Growing evidence suggests exposure to green space has a positive impact on general health and wellbeing reducing physical and mental health problems (Hartig et al., 2014). Additional evidence shows that it can improve cognitive function and behaviour, facilitate social networking which leads to reduced crime, aggression and violence (Barton and Pretty (2010a) and improves other social skills by increasing confidence and self-esteem (Wilson et al., 2010). Individuals who lack exposure to green space are at higher risk of developing poor wellbeing (Guite et al., 2006), a 10% increase in green space exposure to those in urban settings is associated with reducing health problems and increasing wellbeing (De Vries et al., 2003). Urban residents that use the local parks also report feeling more relaxed and physically healthy when they take part in physical activity (Payne et al., 1998).

Previous research detailing how and why green space has an impact on human health and wellbeing has investigated physical, psychological, sociological and environmental factors (Braubach et al., 2017; Markevych et al., 2017). Markevych et al. (2017) detail three different pathways in which green space aids health. These are:

1. **Building capacities** - encouraging physical activity and facilitating social cohesion.
2. **Restoring capabilities** – attention, restoration, and stress recovery.
3. **Reducing harm** – environmental stressors including air pollution noise and heat.

These pathways indicate that green space improves health by having an impact on physical, psychological, social and environmental wellbeing. How and why green space affects these wellbeing pathways and the research around them is discussed below.

Physical health

Improvements in physical health have been associated with green spaces (Egorov et al., 2016; Kondo et al., 2018)**.** Hypotheses suggest that green spaces promote physical health due to opportunities for physical activity (Twohig-Bennett & Jones, 2018). These benefits of activity on health have been well documented (Bull et al., 2020) and green spaces have been shown to encourage physical health by facilitating activity for leisure (Rojas-Rueda et al., 2019).

Green space is associated with improvements in general fitness, weight reduction and pain severity (Wilson et al., 2010). However, it has been argued that a causal relationship between physical activity and green space cannot be established, due to the complex interaction in the benefits of physical activity alone (Lachowycz & Jones, 2013; Lee & Maheswaran, 2011). This argument itself has been disputed, for example in a meta-analysis by Ji et al. (2019) who calculated that physical activity alone explained only 2% of the association between mortality and using green spaces. This suggests that green spaces are important in their contribution to the physical benefits of health and wellbeing but that they might not impact mortality.

In support of this, experiments compared the effects of the same physical activity in a green space versus a non-green space: subjects walking in natural environments showed a decrease in blood pressure compared to those who walked in urban environments (Hartig et al., 2003). A comparison of indoor to outdoor exercise found that individuals experienced less tension, confusion, anger, and depression and felt more energy and positive engagement with feelings of revitalisation (Thompson Coon et al., 2011). The same study reported that feelings of calmness were decreased but this is to be expected as exercise moves the body from a rest state to activity and therefore is not indicative of calm feelings. This lack of calm feeling after exercise in green space could also be due to the many sensory dimensions and therefore increased sensory input of parks and urban spaces (Grahn & Stigsdotter, 2010).

It is important to note that the relationship between physical activity in green space and increased health and wellbeing outcomes is not exclusively beneficial to just individual wellbeing. Bird (2004) calculated the potential economic benefit to the UK of encouraging physical activity within green spaces. They found that UK National Health Service (NHS) could potentially save more than £1.8 million a year if 20% of the population lived within a 2 km radius of an 8-20ha green space and used this space for physical activity for 30 minutes 5 days per week. Their estimations calculated that if an urban park in Portsmouth, England was used, facilitating local physical activity needs through regular activity this could save the local economy £4.4 million, including £910,00 to the NHS a year in economic expenditures due to physical health problems. Bird estimates that even a 3km footpath will provide

16% of total physical activity needs and that “a 3 km footpath on the edge of Norwich could potentially save the economy £1 million, including £210,00 to the NHS”. This economic saving as well as the health benefit makes a strong case for the economic benefit of urban green spaces.

Green space has also been shown to benefit health by having a positive impact on the human immune system. Li and colleagues have found an association between people visiting forests and improvements in immune responses including the expression of a range of anti-cancer proteins (Li, Morimoto, Kobayashi, Inagaki, Katsumata, Hirata, Hirata, Shimizu, et al., 2008; Li, Morimoto, Kobayashi, Inagaki, Katsumata, Hirata, Hirata, Suzuki, et al., 2008; Rook et al., 2013). The mechanism behind this impact has been suggested to be mediated via an immunoregulation pathway. This is named the “Old Friends” hypothesis, by which microorganisms abundant in nature such as bacteria, protozoa and helminths aid the development of the immune systems of those in green spaces and help regulate inflammatory responses (Rook et al., 2013). However, this hypothesis cannot be assumed for all green spaces as the biodiversity of microorganisms is variable. Indeed, this argument for the outstanding benefits of green spaces on physical health cannot be generalised due to the fact that spending time outside increases the likeliness of contracting infectious diseases associated with UK green spaces such as Lyme disease (Shapiro, 2014).

Nevertheless, the association between green space and mortality as previously mentioned in the meta-analysis by Ji et al. (2019) has been shown to link exposure to green spaces with greater longevity (Takano et al., 2002; Tanaka et al., 1996). In longitudinal studies, the reduction of mortality is significantly linked with increasing increments of residential green spaces (Crouse et al., 2017; Ji et al., 2019; Orioli et al., 2019; Villeneuve et al., 2012; Wilker et al., 2014). This association once again is a complex interaction, for example, decreased mortality could be linked to living close to green spaces but individuals who are able to live near green spaces are more likely to be financially richer and more socially advantaged (Mueller et al., 2018). A study supporting this found that wealthier populations tend to show decreased mortality rates as they consume more preventative care at early stages for illness (Cookson et al., 2016). The socio-economic implications must be considered when investigating the links between green spaces and general health and wellbeing as there may be variables in green space accessibility and economic status.

The how and why green space has a beneficial impact on physical health can be summarised in terms of; increasing access and encouragement to undertake physical activity, which has been proven to be beneficial for general health; improving immune responses due to exposure to environmental microorganisms and promoting longevity. The economic benefit of increasing wellbeing via physical activity is an important output for policy decisions that increase urban green spaces. However, the

green space/ physical health mechanisms have complex interactions, it has proved to be difficult to generalise the physical health benefits of green spaces suggesting that the interactions of physical activity benefits, disease prevalence and socio-economic factors must all be considered.

Psychological wellbeing

One of the most well researched and well-known pathways behind green spaces improving wellbeing is the effect of exposure to green space on psychological wellbeing (Maund et al., 2019). Green space has been linked to improving the overall quality of life (Willis et al., 2016) and decreasing burnout, anxiety and depression scores (Sahlin et al., 2015). One hypothesis for why we observe decreasing rates of depression is that exposure to sunlight increases vitamin D production which is thought to counteract seasonal affective disorder (Melrose, 2015). Green space has been associated with lower rates of mental disorders in older adults (Wu et al., 2015). Experimental research has shown reduced symptoms in children with attention deficit disorder who engage with green space in an active way (Taylor et al., 2001). Research has also shown exposure to green space to be linked with improving self-esteem, mood (Barton et al., 2012) and living and working in a green space compared to urbanised areas are related to increasing happiness (White et al., 2013). Exploration into the positive effect of green spaces on mental wellbeing has shown that the amount of green space exposure can make a difference with a 1 km 'green' buffer leading to the largest positive effect on life satisfaction as long as vegetation takes up 11% or 35ha of the buffer area (Bertram & Rehdanz, 2015). However, this research does not take into account the level of engagement and usage of the green area and how long a person needs to spend in it to receive this psychological benefit.

Research studies have investigated how much time spent in green space makes a psychological difference. Barton and Pretty (2010b) observed that exercise in a green space for as short a period as 5 minutes made a difference to self-esteem and mood. A systematic review performed by Bowler et al. (2010) found increased positive self-reported emotions after activities of an hour outside in green spaces. New research suggests that spending 2 hours a week in nature is associated with high levels of wellbeing (White et al., 2019). However, it has been suggested that urban green spaces that are perceived to be overgrown or unmanaged can have a negative effect on wellbeing due to increased anxiety and fear of crime in the area (Bixler et al., 1994; Bixler & Floyd, 1997; Kuo, Bacaicoa, et al., 1998).

Spending time in green spaces has also been shown to reduce stress and improve relaxation. Egorov et al. (2016) discuss the psychosomatic stress reduction theory which suggests that exposure to nature

can have a positive effect among those with high-stress levels by altering the mindset to a more positive emotional state. Indeed, a classic study by Ulrich et al. (1991) found a 10 min video exposure to an everyday nature view (dominated by trees, vegetation or water) produced significant recovery from stress 4–7 minutes faster than participants viewing an urban setting as determined by lowered blood pressure, muscle tension and skin conductance. This effect on stress has also been noted by van den Berg et al. (2010) who investigated green space as a buffer for stressful life events and Kuo (2001) who found that green space reduced mental fatigue and lessen aggression helping people facing major life stressors. This research suggests that exposure to green space provides a restorative effect, helping to reduce stress, enhancing resilience and quickening recovery.

This restorative effect of green spaces is not exclusive to stress but also contribute to all-around wellbeing. Green spaces have been shown to restore direct attention (Hartig et al., 2003; Hartig et al., 1991; Kaplan & Kaplan, 1989) and increase the speed of a child's recovery from attention-demanding cognitive tasks (Wells, 2000). Walking in green spaces has been shown to provide more nature connectivity, cognitive and emotional restoration than urban walks (Cooley et al., 2020). Research has indicated that this restorative value increases with the natural quality, Carrus et al. (2015) found a positive relationship between self-reported benefits and higher levels of biodiversity in a natural area. The restorative and regulatory effect on emotional state and self-experience has been reported by people visiting their favourite places, which are often natural settings (Korpela, 1989, 1992; Korpela & Hartig, 1996; Korpela et al., 2001; Newell, 1997). This research suggests a personal preference for green spaces may mean the psychological benefits of green spaces are most strongly felt by people with a personal preference for nature. For example, a study by Pritchard et al. (2020) found that those who were more connected to nature had increased self-reported eudaimonic wellbeing (happiness through meaning and purpose), and in particular have higher levels of self-reported personal growth, whilst noting that being more connected with nature also has been shown to be connected with higher levels of self-reported hedonic wellbeing (experiences of pleasure and enjoyment). This suggests that the subjective nature of green spaces improvement in wellbeing may be due to different feelings of nature connectedness and therefore not all research can be generalised.

The wealth of research behind the benefits of green spaces on psychological wellbeing is overwhelming. Green spaces have been shown to improve many psychological struggles and impact positively on the ability to cope with stress. However, as each individual's mental wellbeing is subjective and depends on their views and assumptions of happiness (Ferkany, 2012), it can be difficult to generalise findings to the entire population's mental wellbeing. Therefore the complex interactions of green space on wellbeing not just from the perspective of one individual but societally or within a community is important to consider.

Social wellbeing

The impact green spaces have on social wellbeing has been noted as a holistic mechanism by which to increase social cohesion (Jennings & Bamkole, 2019; Maas et al., 2009). Kim and Kaplan (2004) noted that green spaces as natural and open environments enhance a sense of community. A study on Dutch cities (Maas et al., 2009) found that public green spaces contribute to improved wellbeing by being associated with social interaction. This study found that for green space in urban areas, social cohesion and stress were the strongest mediators of health and wellbeing. When investigating in detail Kou and colleagues observed that the greener the neighbourhood, the more the community used these common spaces and the stronger the social ties (Kuo, Sullivan, et al., 1998). Kweon et al. (1998) reported a similar relationship between outdoor common space, the strength of neighbourhood ties and the sense of community specifically for older adult residents of inner-city neighbourhoods. The increase in social interaction and cooperation has also been noted in a study by Dinnie et al. (2013), who observed that it is difficult to differentiate the social and nature aspect which contribute to improved wellbeing.

Environmental wellbeing

Mechanisms explaining how human health and wellbeing is enhanced by improvements to the environment through the introduction of more green spaces can be explained through 3 pathways: reduction in air pollution, noise and heat island effects (Derkzen et al., 2015). Green spaces have been shown to decrease concentrations of air pollutants (Dadvand et al., 2012). Trees and other vegetation can absorb carbon dioxide through sequestration and carbon storage (Litschke & Kuttler, 2008; Nowak et al., 2006). They can also trap particulate matter. Wolch et al. (2014) noted that green space helps to mitigate environmental hazards such as air pollution and noise pollution. Mueller et al. (2017) showed that green belts around urban areas could reduce traffic noise which has been shown to improve stress, sleep disturbance, cardiovascular health and mortality. The validity of these hypothesised health outcomes is once again limited by complex interactions as it is difficult to generalise improved health and longevity due to specifically green space's effects on air and noise pollution.

The environmental mechanisms of green spaces' effects on health and wellbeing have also been hypothesised to be due to the impact of green space through trees and other vegetation on surface radiating temperatures, a phenomenon known as the heat island effect (Shin & Lee, 2005; Sun & Chen, 2017). This cooling effect has been documented to be beneficial for health as it decreases thermal

discomfort in hotter urban areas and is an energy-efficient way of cooling cities, which also benefits the environment by utilising a green energy source

In summary, research shows that green space has an all-around positive effect on health and wellbeing. Using green spaces encourages physical activity which in turn can have an economic benefit, being outside in green spaces benefits the natural immune system and leads to decreased mortality. Exposure to green spaces has been shown to have an impact on social cohesion and community, quality of life, psychological wellbeing, alleviating symptoms of depression, anxiety and stress. The restorative value of green spaces not only benefits mental wellbeing but also the environment, decreasing urban temperatures, noise and air pollution. The main limitation running through almost all of the research in this topic area is the complex interactions of health benefits and being in green space. It is difficult to differentiate whether green spaces have a positive effect on health and wellbeing due to any singular pathway or mechanism or a multitude of physio-psycho-socio-environmental interactions.

Another difficulty with interpreting this research is how green space has been conceptualised to measure wellbeing. The wealth of green space and wellbeing research employs methods that differ between studies. A systematic review of the relationship between green space and the mental wellbeing of adults established six measures of green space (Houlden et al. (2018). These were: '(i) amount of local-area green space; (ii) green space type; (iii) visits to green space; (iv) views of green space; (v) green space accessibility; and (vi) self-reported connection to nature. The review also described the different measures of wellbeing which have been employed included (Table 1.1).

Researchers report a positive association between the amount of local-area green space and mental wellbeing particularly for life satisfaction (hedonic wellbeing). However, they also comment that evidence is insufficient to guide planning decisions. The suggestion from this research is that further study is needed that is based on dynamic measures of green space, reflecting access and uses of green space, and measures of both eudaimonic and hedonic mental wellbeing (Houlden et al. (2018).

Table 1.1. Details of the measures used to evaluate mental wellbeing in association with green space adapted from Houlden et al. (2018).

Wellbeing Measure	Details of measure
Warwick-Edinburgh Mental Well-Being Scale (WEMWBS)(Tennant et al., 2007)	This was the most commonly used measure (14 studies). It measures hedonic and eudaimonic mental wellbeing and includes 14 questions, regarding individual feelings over the past 2 weeks, including "feeling relaxed", "interested in a few things", and "close to others".
SWEMWBS (Shortened-WEMWBS)(Haver et al., 2015)	This is a 7-item version of the WEMWBS.
Personal Wellbeing ONS (ONS, 2013) (Hicks et al., 2013)	Developed by the Office of National Statistics to measure life satisfaction, happiness and anxiety (hedonic wellbeing) and sense of worth (eudaimonic wellbeing).
The WHO-5 Well-Being Index (World Health Organization, 1998)	This measures aspects of mental wellbeing, such as quality of life, life satisfaction, and affect, hedonic wellbeing. Questions ask how frequently individuals have felt "cheerful and in good spirits" and "calm and relaxed", over the previous 2 weeks.
WHOQOL-BREF (Group, 1998)	This measures quality of life in the form of a 26-item questionnaire covering physical and psychological health, social relationships and personal environment.
The SF-36 (Ware et al., 2000)	This measures quality of life in the form of a 36 question questionnaire covering physical, emotional and psychological health.
A brief 12-item version (SF-12)	This is a shortened 12 item version of SF-36 and has three subscales: mental health, vitality and emotional functioning.
The mental component summary (MCS (Ellert & Kurth, 2004)	This focuses on emotional problems, wellbeing, social functioning with questions asking how often the individual recently felt "full of energy", "nervous" and "happy".
The Satisfaction with Life Scale (SWLS) (OECD., 2013)	This measures satisfaction with life with 5 life-evaluation questions and asks how ideal and satisfying the individual's life is, and if they have "gotten the important things. . . in life".
Positive and Negative Affect Scale (PANAS) (Watson et al., 1988)	This measures affect (positive and negative feelings) and use a 20 item questionnaire asking about positive feelings (happiness, interest), and negative emotions (anger, sadness).
The Profile of Mood States (POMS)"(Nyenhuis et al., 1999)	This measure asks about 65 different emotions, including some positive items, such as "lively" and "relaxed.
General Health Questionnaire (GHQ) (Hu et al., 2007)	This questionnaire was designed and validated as a screening tool for psychiatric disorders, with higher scores indicative of greater distress. It contains some positively worded items such as ("In the last 2 weeks I have. . . been able to concentrate", "felt I have been playing a useful part" and "feeling reasonably happy").

1.3 Green Spaces Research Informing Government Policy Decisions

Wellbeing through nature-based solutions and green space intervention is recognised by the Welsh Government as an important step in improving health and wellbeing on a societal level. This is recognised by the Wellbeing of Future Generations (Wales) Act 2015 (Future Generations Commissioner for Wales, 2021), which sets supporting goals for the economic, social, cultural and environmental wellbeing of Wales via Public Health Wales and the Welsh Health and Sustainability Hub. These goals developed into the NHS Wales, Natural Resources Wales joint biodiversity plan 'Making Space for Nature' (Public Health Wales, 2019b) aims to enhance biodiversity and promote resilience of ecosystems. This includes five areas for action, the areas that pertain to this project include:

1. Developing the estate:
    - "look for opportunities on encouraging biodiversity and supporting bees and …diverse planting, wildflower areas for pollinators, and leaving areas of unmown grass"
2. Supporting other public bodies in Wales:
    - "Develop guidance on the Biodiversity Duty for NHS Wales"

These actions will contribute to meeting Public Health Wales' Strategic Priorities/wellbeing objectives, to improve the Welsh Nation's health (Figure 1.1).

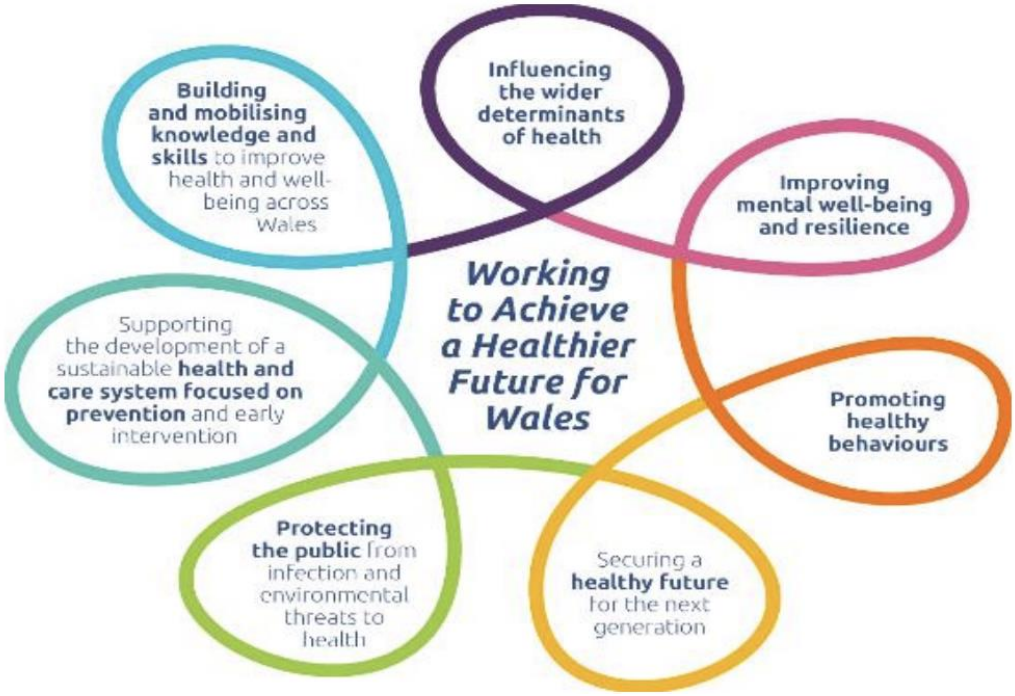


Figure 1.1 Public Health Wales' Strategic Priorities/Wellbeing objectives (Public Health Wales, 2019a)

The report describes how opportunities to encourage biodiversity, for example 'planting native species, wildflower areas for pollinators, leaving areas of un-mown grass; and improving connectivity between valuable habitats' can contribute to increasing the wider wellbeing of the environment. It suggests organisations should, 'Manage the land over which you have control to be wildlife-friendly, and involve staff in the planning and management of this. Take action to support pollinators and become a Bee-Friendly organisation', acknowledging that this will create significant wellbeing benefits for staff, patients, visitors and local communities. These green-space benefits will contribute to securing a healthy future and help move towards, 'A prosperous Wales', by creating resilient ecosystems.

The Wellbeing of Future Generations (Wales) Act 2015, also specifies 'A healthier Wales', with green infrastructure and an 'A globally responsible Wales' by tackling climate change via carbon sequestration both of which will be positively affected via the nature of the green space.

The Centre for Wellbeing at the New Economics Foundation, developed the 'Five Ways to Wellbeing', which promotes evidence-based practices for improving personal wellbeing highlighted by how these strategies can be employed in nature (Aked et al., 2008). These wellbeing strategies include:

1. Connect,
2. Be Active,
3. Take Notice,
4. Keep Learning,
5. Give

This recognition of societal value elevates the importance of green space and the natural environment to personal and societal wellbeing. The tool under development in this study will help quantify the impact of interaction with the green space and provide valuable data in the assessment of wellbeing.

1.3.1 Green Space Interventions

Nature-based interventions and solutions, ecotherapy, nature therapy (La Puma, 2019) and green prescribing are all terms used interchangeably under the umbrella of utilising interacting with nature and green spaces for health and wellbeing. Nature-based interventions have been shown to be effective at improving wellbeing (Bragg & Leck, 2017) and it has been noted that a single intervention can affect individuals in a range of ways (Shanahan et al., 2019). A review of nature-based interventions for mental health, commissioned by Natural England (Bragg & Atkins, 2016) evaluates all interventions providing social, therapeutic horticulture, environmental conservation activities and

therapeutic farming. The review noted that services usually include a combination of three key ingredients: the natural environment, meaningful activities and social context. These services were shown to have positive health outcomes similar to those discussed above e.g. improved self-esteem, confidence, mood, attention capacity and cognition, happiness and quality of life and decreased depression anxiety and stress. A similar study by Bragg et al. (2013) for the mental health charity Mind concludes that eco therapy effectively improved a range of wellbeing factors including, improved social connection, encouraged a healthy lifestyle and helped participants to become more eco-friendly.

Green prescribing builds on social prescribing which is defined as 'connecting citizens to community support to better manage their health and well-being' (Rees et al., 2019). Green prescribing is when this support in the community provides nature-based solutions, green space interventions and encourages interaction with green spaces (Shanahan et al., 2019). Bloomfield (2017) found patients who attended a nature-based activity for 10-12 weeks showed a 69% increase in positive self-reported wellbeing. Swinson et al. (2020) reviewed green prescriptions in green walking groups, finding improvements in mood, self-esteem, reflection on life tasks, and symptoms of depression. McEwan et al. (2019) undertook a randomized control trial using a smartphone app to prompt adults to notice things about natural or urban spaces and report a significant improvement in wellbeing especially for those in the natural environments who suffered from mental health problems. The results indicate that a phone-based app could be used to support green prescriptions.

While the evidence suggests that engaging with green spaces has a positive impact on the wellbeing of patients there are few studies exploring the impact of green space engagement on the wellbeing of healthcare professionals. The use of these types of interventions has been suggested by Newson et al. (2020) to be well suited to a workplace context, especially within the NHS.

1.3.2 Green Spaces in Hospitals

Green spaces in the workplace have been incorporated into healthcare sites as the medical settings can be stressful environments for patients, visitors and staff. Hospital gardens can provide important places for relaxation and restorative feelings (Hartig, 2008). Ulrich (2002) details the health benefits of gardens in hospitals and healthcare facilities and describes them as locations that provide a pleasant and calming environment and help reduce stress by providing a place to escape clinical settings. They also help improve clinical outcomes by fostering access to social support and privacy. This effect was noted not only for the patients and visitors but also for staff who often face stressful working

conditions and have little control or authority over decisions that are made due to staffing shortages (Buchan et al., 2019). This stress can adversely impact the quality-of-care clinical staff can deliver. A report into the health and wellbeing of NHS UK staff stated that increased patient safety, patient experiences of the NHS and the effectiveness of patient care all correlated with higher levels of staff health and wellbeing (Boorman, 2009). Marcus (2007) lists the advantages of a hospital garden including a reduction in stress for patients' staff and visitors, reduced pain, and reduced depression in visitors. Higher quality of life for chronic and terminally ill patients have also been reported in hospitals with a garden. Further advantages include increased patient mobility and independence of movement, reduced costs as the length of stay are shorter and fewer pain medication doses, higher patient satisfaction and increased job satisfaction. This research suggests that access to a garden or a green space could benefit patients, visitors and staff.

1.4 Current Research Purpose

Research has shown exposure to green spaces can affect the social, physiological, psychological and environmental aspects of wellbeing. However, as discussed previously, research into the benefits of green spaces on health and wellbeing has utilised a variety of tools to measure wellbeing and green space making it difficult to compare results between studies. Further research is needed that develops an assessment tool that reflects access and use of green space and measures eudaimonic and hedonic mental wellbeing (Houlden et al., 2018). A standardised, quantifiable, repeatable and easy to use tool, needs to be created to assess the impact of green space on wellbeing with different populations and in different green spaces.

1.5 Research Aims

The primary aim of this current research project is:

1. To design and evaluate a tool to assess wellbeing in relation to green spaces.
2. To create a green space at an NHS hospital site from which staff, patients and visitors can benefit, within which the tool can be tested.

The objectives to meet this aim were:

1) To design and evaluate a tool to assess wellbeing in relation to green spaces.
    a. Develop a first iteration of the tool
    b. Implement and evaluate the tool with hospital staff utilising the green space in a longitudinal design.
2) To create a green space at an NHS hospital site from which staff, patients and visitors can benefit, within which the tool can be tested.
    a. Work with hospital staff to curate ideas for the garden
    b. Engage hospital staff to create the garden.
    c. Collect feedback from staff on garden use and impact on wellbeing once created.

1.6 Significance

Given the evidence suggesting a positive link between green spaces and wellbeing, and the strong steer from the Welsh Government about the importance of developing and maintaining green spaces for wellbeing, this project aimed to co-create (with staff) green space on the grounds of the NHS Hospital at Ysbyty Ystrad Fawr (YYF) in Caerphilly (Chapter 5). This green space would allow for the restorative benefits of green spaces to alleviate the stressors of a medical workplace. By creating a green space at the YYF hospital site, this project aimed to build towards the Wellbeing goals of the Future Generations Act (2015) by increasing biodiversity and encouraging individuals to spend time outside, socialise, be active and engage with nature.

By developing a standardised tool for measuring wellbeing in green spaces, in partnership with NHS staff this project aims to develop a resource that could be used to support studies evaluating wellbeing across other NHS sites in Wales.

1.7 Impact of the COVID-19 Pandemic on the Current Research

On March 16th 2020 non-essential work within NHS settings in Wales was discontinued due to the COVID-19 pandemic and as a consequence, this research project was put on hold. This meant that the researcher was unable to access NHS staff or visit the study site at YYF. In the original proposal, the researcher had planned to work with NHS staff to co-create a wildflower garden on the grounds of the hospital and to develop and trial a wellbeing tool that could be used by NHS staff visiting this green site. By March 16th 2020, when interaction with the NHS hospital was limited, the development of the green space at YYF had been underway since October 2019 and the design of the wellbeing tool had been completed. However, delivery and evaluation of the wellbeing tool with NHS staff had to be cancelled. Given the restrictions to the NHS site, the research plan was modified since interaction with NHS staff was extremely limited. The original study aims could still be met however, significant changes were made to the objectives and strategy used to address the research aims.

The objectives altered in light of the COVID-19 pandemic to meet the aim were:

1) To design and evaluate a tool to assess wellbeing in relation to green spaces.
    a. Development of a tool to measure the effect of green space on wellbeing
    b. To refine this tool through a pilot study using Cardiff University staff to implement and evaluate the tool.
    c. If possible pilot the tool with NHS staff as originally proposed.
2) To create a green space at an NHS hospital site from which staff, patients and visitors can benefit.
    a. Work with hospital staff to curate ideas and development of a rewilded green space for wellbeing.
    b. Engage online with the local community around the site to collect feedback on the green space project.
    c. If possible collect feedback from NHS staff on garden use and impact on wellbeing once created.

1.8 Thesis Structure

Chapter 1: Introduces the research context, a literature review of the current wellbeing and green space research framing the study. Research context and purpose is discussed with, research aims and objectives, research significance and the impact of the COVID-19 pandemic.

Chapter 2: Design process for creation of the wellbeing tool. An overview of the tool evaluation through iterative design and general methodology of a 2 phase pilot study.

Chapter 3: Phase-1 of the pilot study describing implementation and evaluation of the first iteration, (tool 1) with a population of Cardiff University staff and use of feedback to create tool iteration 2.

Chapter 4: Phase-2, implementation and evaluation of tool iteration 2, with a population of Cardiff University staff and postgraduate students to inform the final tool iteration design and suggests, recommendations for future studies utilising the tool.

Chapter 5: The design and concretion of the rewilded green space at YYF. Feedback, reflections and future work collected from the online community and NHS staff.

Chapter 6: Review of research aims and how these were met through research findings. A discussion of strengths and limitations and recommendations for further use of the tool and development of the green space. Researcher reflections and conclusions are included here.

Chapter 2 Methodology

This chapter describes the design process and evaluation of a reliable research tool used to assess wellbeing in relation to green spaces.

2.1 Methodological Process

A two-phase pilot research study was implemented to evaluate the tool and develop its subsequent final iteration. Specific research design and methodology for each phase will be covered in more detail in chapters 3 and 4.

In order to meet the aims of this pilot study, the methodology was split into 2 steps,

1. Design - Creation and preliminary test of the tool
2. Evaluation – how the tool would be evaluated through subsequent pilot studies.

2.2 Tool Design

The overall objective of the tool was to evaluate the wellbeing of participants before and after they spend time in green spaces (pre and post-intervention). In order to do this the tool concept requirements included:

- General demographic questions to determine groups of participants
- Measurements of wellbeing
- Questions about the green space
- Feedback questions informing the development of a subsequent tool iteration

In order to improve participation, the tool survey had to be practical, easy and quick to use so that participants did not struggle to complete the task.

The survey was repeated before and after spending time outside in a green space in order to collect wellbeing measures for comparison pre and post-intervention.

An online survey was developed to deliver the initial iteration of the tool, this combined validated wellbeing measurement tools and non-validated green space questions with feedback/evaluation questions. The tool included 2 measures of psychological wellbeing, one measure of physiological

wellbeing and one measure of social wellbeing. was designed to collect data online via any device with internet access allowing participants to complete the measures in their own time.

The online tool was trialled and refined towards a future goal of use in an online application (app) that will be completed quickly and easily by participants before and after spending time outside in green spaces. Figure 2.1 demonstrates an overall summary survey structure and demonstrates how the survey will deliver the tool and collect feedback for evaluation.

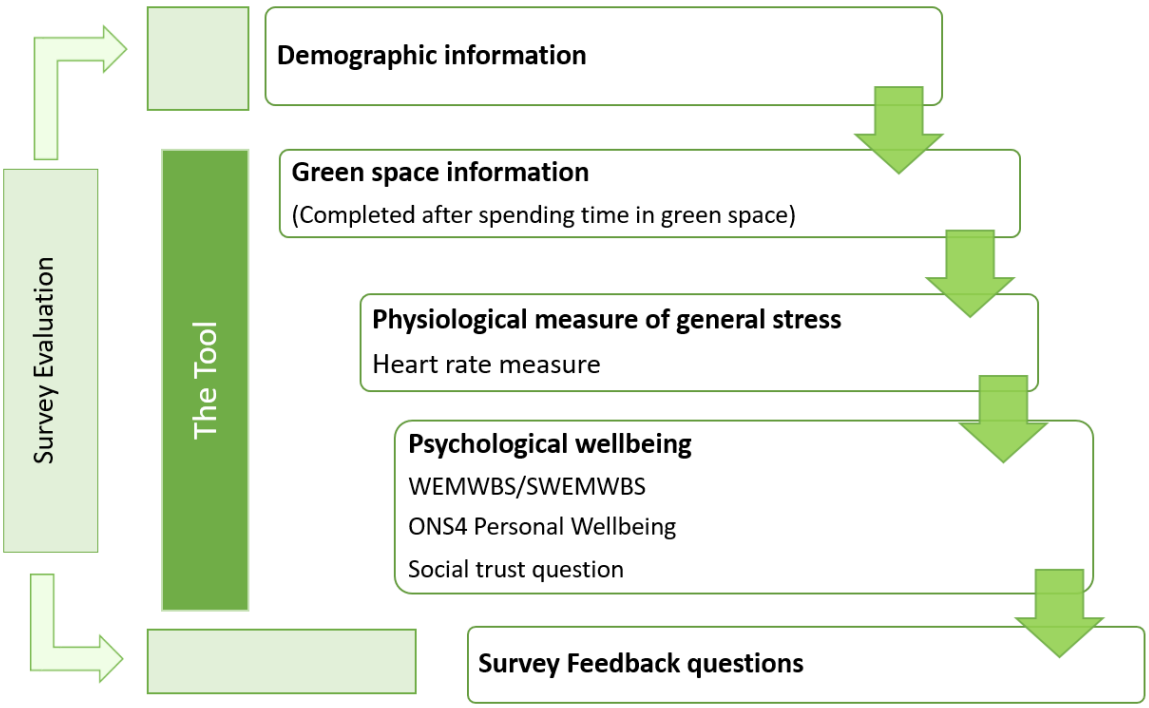


Figure 2.1 General survey structure differentiating between tool design and survey evaluation

2.2.1 Validated Measures of Wellbeing

As discussed in chapter 1.2 wellbeing can be analysed and measured in different ways depending on the aspect the researcher is trying to assess. This has resulted in many different validated measures of personal wellbeing and includes the Satisfaction with Life Scale, Scale of Positive and Negative Experience, Flourishing Scale, the Positive and Negative Affect Scale (Linton et al., 2016); McDowell (2010). Commonly used validated measures of subjective wellbeing (Steptoe et al., 2015) were chosen to create comparative data sets that could be used in future large scale population studies.

Validated scales such as the Warwick–Edinburgh Mental Wellbeing Scale (WEMWBS) (Tennant et al., 2007)and the Office of National Statistics: Personal Wellbeing Questions (ONS4) (Tinkler & Hicks, 2011) are two wellbeing tools that measure all round subjective wellbeing. These scales are

recommended in the handbook, 'Which tool to use? A guide for evaluating health and wellbeing outcomes for community growing programmes' (Health, 2016) noting that the ONS4 and WEMWBS are often used together to "to compare, to benchmark and to support economic evaluation" in green space projects and nature-based interventions.

Other recommended wellbeing tools of measurement were taken from 'Measuring Wellbeing. A guide for practitioners, the New Economic Foundation (NEF) (foundation), 2012). This document is designed for use of professionals measuring wellbeing in the workplace and recommends the use of the Short Warwick- Edinburgh Mental Wellbeing Scale (SWEMWBS), the ONS4, and a question on social trust which is "known to be a key factor for wellbeing". NEF recommends that all three measures of wellbeing are used together to create a more complete data set for analysis.

The recommended workplace wellbeing tools are the WEMEBS and the ONS personal wellbeing questions with other complementary measures for gathering a more well-rounded view of wellbeing (foundation), 2012; Health, 2016). A report by the "<National Accounts of Well-being.pdf>") discusses two measures of wellbeing, 'personal wellbeing' is defined as "people's experiences of their positive and negative emotions, satisfaction, vitality, resilience and self-esteem and sense of positive functioning in the world" and 'social wellbeing', defined as "people's experiences of supportive relationships and sense of trust and belonging with others". Both aspects are considered vital when measuring how people experience their lives and after consideration of the social trust question recommended by NEF, it was decided to add it to the study. It was hoped that this would reveal a more well-rounded perspective on individuals' subjective wellbeing related to social community.

The tool measures are seen in figure 2.1 and survey design are discussed in more detail below.

2.2.1.a Psychological Wellbeing Measures – Warwick Edinburgh Mental Wellbeing Scale (WEMWBS)

The Warwick-Edinburgh Mental Wellbeing Scale, (WEMWBS) (Stewart-Brown et al., 2009; Tennant et al., 2007), was developed to enable the monitoring of mental wellbeing in the general population and for the evaluation of projects, programmes and policies which aim to improve mental wellbeing. It works well as a 'before' and 'after' tool to measure wellbeing and the impact of an intervention or specific programme. The scale explores different elements of general wellbeing, specifically, effective emotional aspects, cognitive evaluative dimensions and psychological functioning. This tool is validated and is widely used to evaluate wellbeing (Koushede et al., 2019).

This WEMWBS is also the most commonly used measure of wellbeing in adults when investigating the relationship between wellbeing and green space (Houlden et al., 2018). It has previously been

demonstrated that this scale is sensitive to differences in the wellbeing of social housing tenants living in buildings with or without surrounding trees, and to perceptions of local green space quantity, quality and safety, (Gilchrist, Brown & Montarzino 2015) and has been efficient in evaluating wellbeing in relation to green exercise interventions (Houlden et al., 2018; Rogerson et al., 2020). Although this measure has been validated to assess the mental wellbeing of the general population, there is discussion around the measure's sensitivity to significant life events which could have a significant impact on participants' responses suggesting further research is needed (Fat et al., 2017). It could be argued within the COVID-19 Pandemic significant life events had changed for all, impacting personal wellbeing in different ways. There is also an argument for the scale being too long for a wellbeing measure, however, the questions have been carefully selected and in the context of this pilot study, this was still determined to be an appropriate tool.

The WEMWBS tool consists of a series of statements rated on a 5-point Likert scale from 'none of the time' to 'all of the time'. The participant is asked to rate 14 questions:

1. 'I've been feeling optimistic about the future',
2. 'I've been feeling useful',
3. 'I've been feeling relaxed',
4. 'I've been feeling interested in other people',
5. 'I've had energy to spare',
6. 'I've been dealing with problems well',
7. 'I've been thinking clearly',
8. I've been feeling good about myself',
9. 'I've been feeling close to other people',
10. 'I've been feeling confident', '
11. I've been able to make up my own mind about things', '
12. I've been feeling loved',
13. 'I've been interested in new things'
14. 'I've been feeling cheerful'

The WEMWBS is scored by a range of 1-5 for each question. The total score is summed and will range from 14-70. A low score indicates low subjective wellbeing (14-42) and a high score indicates good subjective wellbeing (60-70).

The SWEMWBS (Short Warwick-Edinburgh Mental Health Scale) is a shortened version of WEMWBS (Fat et al., 2017) containing 7 rather than 14 questions selected for their internal consistency and completed using a 5-point Likert scale from 'none of the time' to 'all of the time'.

The statements include:

1. 'I've been thinking clearly',
2. 'I've been feeling useful',
3. I've been feeling relaxed,
4. I've been dealing with problems well,
5. I've been feeling optimistic about the future',
6. 'I've been feeling close to other people',
7. 'I've been able to make up my own mind about things'

The SWEMWBS is scored in the same way, results ranging from 7-35, again a low score indicates low subjective wellbeing (7-19.5) and a high score indicates good subjective wellbeing (35-27.5). The SWEMWBS has been shown to elicit similar results to the WEMWBS and is a popular measurement, commonly used (Fat et al., 2017). The preliminary survey used the WEMWBS, and in the main survey, the SWEMWBS was used to encourage participation and compliance (shorter and therefore takes less time to complete) whilst still performing as well as the WEMWBS.

In summary, the WEMWBS and SWEMWBS were chosen as self-report measures, completed online or on paper, which covers positive attributes of wellbeing with both feeling and functioning. Their psychometric properties have been proven to be sensitive to wellbeing intervention (Tennant et al., 2007), they are both easy to complete and widely validated within the health sector.

2.2.1.b ONS Personal Wellbeing Questions

Office for National Statistics (ONS) uses four survey questions to measure personal wellbeing which will be referred to as 'ONS4' from this point onwards to differentiate between wellbeing measurements and the organisation (Dolan et al., 2011a). It should be noted the ONS utilise personal wellbeing and subjective wellbeing interchangeably, it can therefore be assumed this measure although referred to as a measure of personal wellbeing is a subjective wellbeing measure. The Measuring National Wellbeing programme has been aiming to "develop and publish an accepted and trusted set of National Statistics which help understand and monitor Wellbeing". These measures have been used to assess subjective or personal wellbeing from Nov 2010 to most recently 2021 (Catuara-

Solarz et al., 2021). The ONS4 is often used in conjunction with other wellbeing measures including the WEMWBS which investigates not only feeling and functioning but also considers life satisfaction and meaningfulness. Participants are asked to respond to the questions on a 0 to 10 Likert scale where 0 is "not at all" and 10 is "completely",

1. Overall, how satisfied are you with your life nowadays?
2. Overall, to what extent do you feel that the things you do in your life are worthwhile?
3. Overall, how happy did you feel yesterday?
4. On a scale where 0 is "not at all anxious" and 10 is "completely anxious", overall, how anxious did you feel yesterday?

The four questions have been used as part of 'the Annual Population Survey (APS)' and the 'APS Personal Wellbeing dataset', evaluating personal wellbeing in the UK since 2011. Each question is scored individually on its 11 point scale and banded into 'very high', 'high', 'medium', 'low' or 'very low'. For example:

For life satisfaction, worthwhileness and happiness,

- 9 to 10 is considered very high,
- 7 to 8 is high,
- 5-6 is medium,
- 0-4 is low.

For anxiety,

- 6 to 10 is high,
- 4 to 5 is medium,
- 2-3 is low,
- 0 to 1 is very low.

This ONS4 scale was chosen to be included in the study tool alongside the WEMWBS to ensure a comprehensive measure of wellbeing data.

2.2.1.c Generalised trust question – European Quality of Life Survey

Research has shown there are trends between social capital; defined by Putnam (2000) p. 19 as "connections among individuals – social networks and the norms of reciprocity and trustworthiness"; and subjective wellbeing (Sarracino, 2010). This suggests that trust is the key element to social capital (Churchill & Mishra, 2017; Helliwell & Putnam, 2004). To investigate this a generalised trust question

was added aiming to collect feedback on the impact of green spaces on the social and community aspect of wellbeing. A multilevel analysis of data from the European Quality of Life Survey concluded that social trust positively affects subjective wellbeing (Delhey & Dragolov, 2014) and that social trust buffers and thus reduces inequality of wellbeing (Akaeda, 2020). To assess this social aspect of wellbeing, a social trust question was selected from the 2012 European Quality of Life Survey. The single question survey measures social trust is recommended by the New Economics Foundation (foundation), 2012). The question is:

> *'Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people? Please tell me on a scale of 1 to 10, where 1 means that you can't be too careful and 10 means that most people can be trusted.'*

The question was added to the first tool iteration pilot study as a measure of wellbeing whilst acknowledging that a single question may not have the capacity to collect information on the impact of green spaces on social and community wellbeing.

2.2.2 Physiological Stress Measures

Research has shown that a relationship exists between green space exposure and improvements in physiological measures including heart rate, cortisol, blood pressure and skin conductance (Richardson et al., 2017; Twohig-Bennett & Jones, 2018). A further tool to measure changes in heart rate (HR) was included in the study. This quantified the restorative effects of green spaces on stress, a physiological aspect of wellbeing.

Heart rate is linked directly to acute stress measures as dynamic responses to stress cause changes in the automatic nervous system. In a meta-analysis, Twohig-Bennett and Jones (2018) found exposure to nature was related to lowering in HR. Walking 15-20 minutes in a green space (compared to an urban space) has been found to lead to decreased HR (Park et al., 2009; Song et al., 2014; Song et al., 2015; Song et al., 2013). However other research has also shown exposure to green spaces to not affect HR (Brown et al., 2014; Hartig et al., 1991).

HR was chosen as a measure of wellbeing as it is non-invasive and needed no specialist equipment compared to other physiological assessments eg. Cortisol. Heart rate is measured in beats per minute and is usually measured at rest with the participant is sitting down (Grazuleviciene et al., 2016; Hartig et al., 1991). However, heart rate can change dependent on stress responses, recent physical exercise, and even caffeine intake therefore controlled settings are needed to determine causality.

The tool required participants to input their HR measures before and after spending time in a green space using an HR monitor that could be easily accessed. They were required to use a single device to ensure consistency and encouraged to use a smartwatch or other wrist-supported HR measuring device if available. For individuals who did not have access to such devices, a free-of-charge HR measuring app was suggested by the researchers, Instant Heart Rate®, which is compatible with most smartphones. It was noted that some participants may not have access to either option and therefore would not be able to take part in this section of the study, however feedback opportunities throughout the survey allowed for this data to be collected.

The Instant Heart Rate® app uses a smartphone camera to measure HR. It was, therefore, important to evaluate the chosen HR app against a blood pressure monitor that also measured HR, so that the phone application could be tested for validity prior to data collection.

2.2.2.a Validating the Chosen Heart Rate Measurement App

Research into the validity of smartphone applications, including 'Instant Heart Rate®', has shown that the HR measurements correlated well with readings from ECG monitoring. (Liu & Chan, 2016; Parpinel et al., 2017; Pipitprapat et al., 2018; Vandenberk et al., 2017). However, it was decided that a pragmatic test using different smartphone models with the Instant Heart Rate® would further validate the use of Instant Heart Rate for this present research.

A trial was conducted using convenience sampling as the time period for data collection was limited. 10 participants of varying ages from 20 to 56, the consistency of measures was compared between the Instant Heart Rate® app compared to an Omron M2 upper arm Blood Pressure Monitor. Each participant measured HR three separate times by simultaneously using the Instant Heart Rate® app compared to the Blood Pressure Monitor (BPM). All measures were taken at rest with the participants sitting down.

The results of the trial can be seen in Figure 2.2 demonstrating the mean HR scores/beats per minute of the 3 measurements for each participant. These are measured for the app and the BPM comparatively. Figure 2.3 demonstrates the mean difference in beats per minute for each participant so that the difference between the BPM and app can be analysed. The results showed that concurrent with previous research, the app gave very similar readings to the BPM measurements with a mean difference of 1bpm or lower between the 2 devices for 9/10 of the participants. These findings implied that there was little variation between the measurements from the two monitors and showed confidence in using the app for future study participants measuring HR.

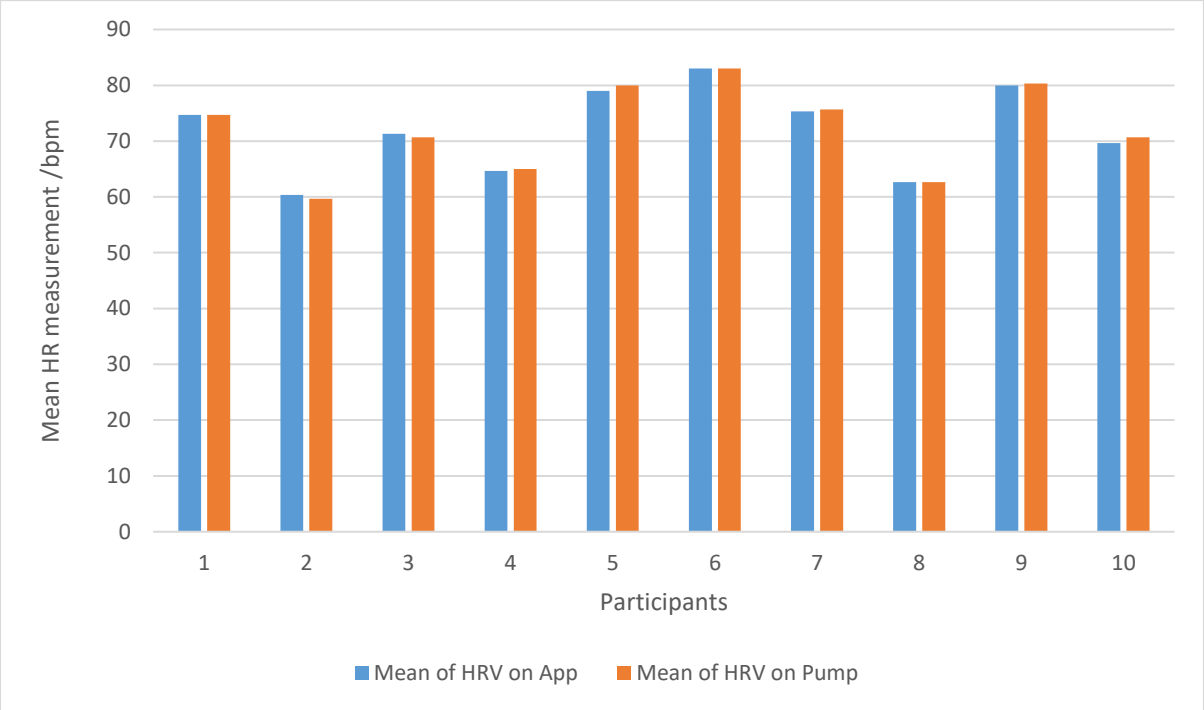


Figure 2.2 Comparison of Mean phone app measurement/bpm with mean blood pressure measurement/bpm for each participant

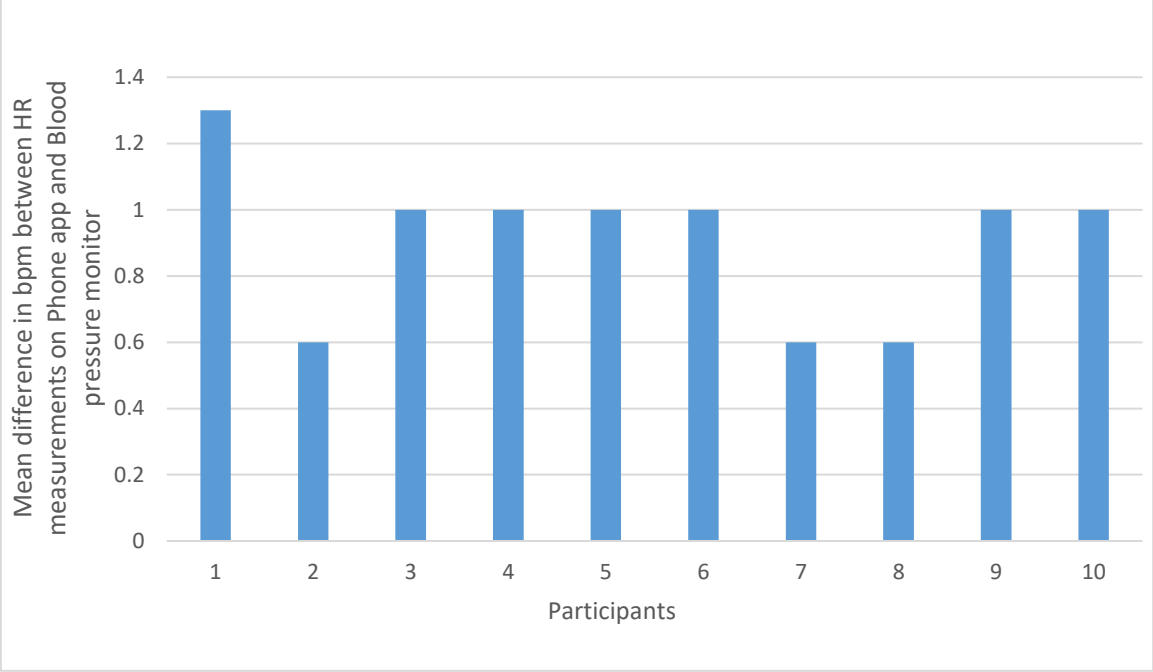


Figure 2.3 The mean difference between mean phone app measurements/bpm with mean blood pressure measurements/bpm for each participant.

2.2.3 Non-Validated Survey Questions

As seen in Figure 2.1 in addition to wellbeing measures, survey questions were included to collect information relating to the participant, the green space visited and survey feedback. These non-validated measures are significant for the evaluation of the tool through pilot studies.

2.2.3.a Measure of Green Space

Green space can be measured and characterised by many things; the amount of local area green space, green space types, visits to green space, green space accessibility and subjective connectedness to nature (Houlden et al., 2018). These characteristics have also been described in studies by Hunter et al. (2017); Kondo et al. (2018). These researchers measured wellbeing against, participant location or a green space exposure measurement such as; green space characteristics of a residential area; green space characteristics of activity space; nature walk/runs; greening interventions; nature leisure experience and residential relocation. The characteristics determine the classification of green space depending on the research aims.

Initially, the study intention was for NHS staff participants to be using a singular green space which would provide a consistent measure. However, due to the COVID -19 pandemic, access to the site was not possible during the study period. Adjustment in the study population and local COVID -19 lockdown restrictions that ensued during the study period allowed participants to only use green space in their local home neighbourhood. Green space was therefore defined to the participants in the survey as “any green vegetation” and this could be, for example, a participant’s garden or the local park as long as it was outdoors, green and natural.

The first question in the survey asked whether the participants were completing it before or after green space interaction. If ‘before’ then the participant would continue straight onto the next section (the HR measure), if ‘after’ then the participant would be shown questions relating to the green space, before proceeding to the HR measure. In order to investigate the restorative effects of green space, a question followed asking how much time the participant had spent in the green space. Two further questions asked participants how engaged they felt with the green space and whether they were interrupted by work. These last two questions were included to investigate whether the participants noticed nature uninterrupted. Stepansky et al. (2021) describe “active engagement is a holistic process of the mind and body with intentional and mindful usage of green space. This may include physically walking within the sensory-stimulating space, sitting on a moving swing while viewing the landscape, or touching and smelling aromatic plants.” Richardson et al. (2021) describe how engaging with nature

includes activities such as sitting and relaxing in a garden, smelling wildflowers and taking time to notice the butterflies and the bees. Passmore and Holder (2017) have found a relationship between engaging with green spaces by taking time to notice nature and improved wellbeing. Therefore, these questions about engaging with nature were included.

2.2.3.b Demographic questions

Demographic questions provide important data for a pilot study as this allows the researchers to get a sense of the diversity of participant characteristics (Fernandez et al., 2016). The study data collected participants' demographic information including age group, gender, employment status and a baseline state of mental wellbeing. Age and gender were collected to better understand respondent characteristics, employment status asked participants to state whether they worked full time or part-time, to assess the impact of work time on their ability to complete the survey. A baseline measure of self-perceived wellbeing was recorded with the demographic information as a comparison to the wellbeing measures.

2.2.4 Survey Feedback questions

To assess the feasibility of the pilot survey, the participant was asked to give feedback on each element of the tool throughout the questionnaire as well as the general survey design (see Figure 2.1). This feedback was necessary to assess and evaluate the tool design resulting in refinements for the tool for the next iteration.

<u>Feedback questions</u>

Each section of the survey included 3 feedback questions:

'Please use the box below to provide some feedback on your thoughts about this part of the questionnaire? (e.g. Including ease of completion, time taken, relevance or anything else you think should be included)'. These prompts indicated the kind of feedback that would prove helpful to the researcher and the free text box allowed participants to give qualitative feedback in their own words. These free text boxes were included after every measure of the survey (see figure 2.1).

The wellbeing measures were followed with questions developed to evaluate the participant's response to the smiley face grading used in the wellbeing section of the survey (see section 2.2.5).

Responses were prompted by two questions to which participants could answer 'Yes', 'No' or 'Don't Know';

1. *Did you find the smiley faces helped you in providing your evaluation in this section?*
2. *Would you prefer to use the faces alone, without the number scale?*

2.2.5 Smiley Face Response Scales

Smiley faces were added to the wellbeing questions response choices In order to make the survey quick and easy and engaging for participants. Measures asked participants to rate themselves on a numerical scale accompanied by smiley faces. It was hypothesised that this visual input would be more engaging for participants and that using smiley faces would make answering the questions, easier and more accessible. Emde and Fuchs (2012) discussed how using smiley faces to evaluate global satisfaction of reading journals lead to a more enjoyable question-answering process and noted that the colour and size of the faces don't affect response values. In this pilot study, it was decided that smiley faces would complement the Likert scales to evaluate wellbeing and facilitate a more visually engaging answering experience for participants (see Figure 2.4).

Using smiley faces has become increasingly more common with satisfaction questionnaires since its development as a scale in 1955 (Kunin, 1955). McDowell (2010) describes how smiley faces can successfully be used as a wellbeing measurement when evaluating how a person is feeling. No research has been completed directly using smiley faces with the WEMWBS, SWEMWBS, ONS4 scale or the Social trust question that was proposed for this current tool, however, smiley faces have been used to assess, pain (Chambers et al., 1999), job satisfaction (Kunin, 1955), overall satisfaction (Stange et al., 2016) and emotional response (Kawakami et al., 2020) and pain scale McDowell (2006, p. 578).

Nevertheless, other research has noted that smiley faces may be an unreliable tool to collect data when compared to numerical responses to Likert scales. Stange et al. (2018) found that smiley faces made no significant improvement in survey response time but suggest that smiley faces can be useful when evaluating participants with lower literacy. Kawakami et al. (2020) describe how smiley faces are used as response options for children who have not fully developed literacy and communication skills. This study, however, found inconclusive results and suggests that this was due to limited facial expressions, biases towards each end of the scales and notes that facial expression meaning can differ with participant's culture. Elfering and Grebner (2008) also found smiley faces to be an unreliable measure as they found variability between participant interpretation of what the faces represent and in which face should be the middle 'neutral' face. Hall et al. (2016), found smiley faces to be an ineffective method of communicating judgements with nine to ten-year-olds. Toepoel et al. (2019)

state that is unclear whether pictorial answer categories such as smiley faces can replace verbal, written or numerical scales as a form of measurement in surveys but did find that coloured "*negative ratings in orange/red and positive ratings in green"*, smileys produced average answer scores that were similar to that of traditional radio buttons when evaluating survey experience. In conclusion it is noted that smiley faces are not all always appropriate and must be matched to the question being asked.

In recent years with the rise of online communication, using pictures in text such as emojis have become commonplace. Emojis are similar to and thus have replaced emoticons and smiley faces in recent research, assumedly because they are more recognisable and commonplace. Alismail and Zhang (2020) discuss the advantages and limitations of using emojis in research, such as participants reporting that the emoji scales were ageing and easily understood, however similarly to the smileys the subjectivity in the interpretation of the emojis mean that they are not universally standard. Interestingly, this research found subjectivity in participants whether they were interpreting emoji or the numerical Likert scale which suggests that the problem with interpretation is not limited to faces, but that it may be the scale itself. A similar result was found by Deubler et al. (2020) using emojis to evaluate children emotional responses to written stimuli (situation and food flavours) and tasted products, finding concurrent responses whether the participants used an emoji scale or a written response scale. Research by Kiliç et al. (2021) concludes that emoji response categories can be used instead of Likert response categories. Since the research using smiley face response scale and with wellbeing scales is inconclusive the researcher decided to test the pilot tool using smiley faces.

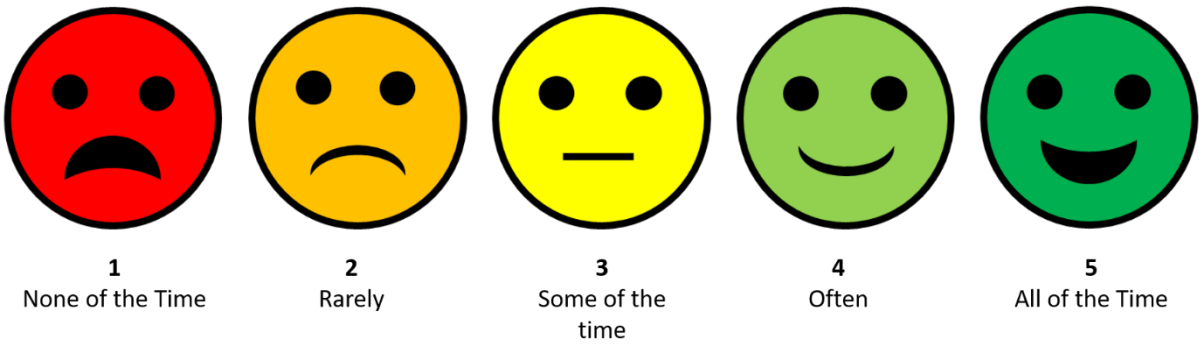


Figure 2.4 Smiley faces with numbers and descriptors to represent Likert scales

2.2.6 Survey Delivery

Surveys are typically carried out on paper or online (Sue & Ritter, 2012). As the surveys would need to be completed in the participant's own time before and after spending time in green spaces and in

their own homes, (due to lockdown measures) an online survey was chosen as most appropriate. Participants would be able to access the survey on a smartphone/ tablet or PC from a link sent by email before completing. it

Sue and Ritter (2012) describe how delivering surveys online provides many opportunities for research but also provide new challenges for researchers. This method of survey delivery was chosen for the advantages of being low cost, fast, efficient, reaching a wide geographical demographic, leading to immediate data entry and collection and thus ease for the researcher whilst allowing anonymity and reducing interview bias. These advantages would benefit the tool delivery as the survey would be easily accessible for participants. The main disadvantage of using online survey methods involve reliance on software. This should be considered in a larger-scale study, especially when utilising populations with digital poverty. However, for the convenience sample from the chosen population of Cardiff university staff (many of whom were working from home), it was assumed that this survey would be easily accessed through a PC and distributed through staff channels. Therefore, online was the best overall option for survey delivery particularly as undertaken during a lock-down isolation period.

The survey was hosted through JISC 'Online Surveys' previously 'Bristol Online surveys', a delivery website selected as the survey design tool was accessible at no cost to Cardiff University students and contained an easy layout of survey design features.

2.3 Final Survey Design Test

User-review of the finalised design

The final design of the online survey was trialled on 5 participants to assess face validity and evaluate any flaws. The only reported error was that the smiley faces were the wrong way around and therefore did not match up with the Likert scale numbers when reporting positive or negative wellbeing. Feedback was also received indicating that if the smiley face images were just at the top of the questionnaire rather than attached to each question it would be less disruptive and allow easier answering.

These edits were made following a final review by the research team. The tool was designed on the online surveys platform ready for delivery and piloting.

2.4 Research Design

The second step, the implementation and evaluation of the tool, was completed through an iterative process. Using pilot studies to collect feedback on the tool's design, informed the next iteration, which could then be further evaluated. This iterative process was used to develop a third and final tool design.

2.4.1 Iterative Design

Hauschild, Rosenbaum & Olsen (2018) described the optimal way to evaluate a product or system, a Life Cycle assessment. This is an iterative process of evaluation of a product or system throughout its life cycle allowing for feedback to inform the new iteration and saving time and money when implementing a new design. For example, evaluating adaptions to evidence-based practices (Miller et al., 2020) and intervention development (Nahum-Shani et al., 2015). The UK Medical Research Council guidance recommends systematic development, feasibility testing, piloting, evaluation, and implementation of the intervention in an iterative fashion (Craig et al., 2008). This continuous cycle of planning, analysis, implementation, testing and evaluation describes the iterative design model as best to continuously evaluate a new design. It was decided that this process model would be ideal for the evaluation and development of the wellbeing tool.

Eby (2019) describes how the iterative design model is commonly used in product design, software development and qualitative research. The model allows a prototype to be tested, evaluated and revised until a final design is achieved. They describe how the limitation of using such a model is that in order to have multiple iterations, multiple pilot studies are required for evaluation. Despite this drawback, in this present research, this repetitive cycle of the continuous evaluation was felt to be the most appropriate approach for tool evaluation.

As shown in Figure 2.6, after completing the initial planning Stage 1, stage 2: 'Analysis and Design' creation of the tool was the next step carried out, with testing of that version the next step in the iterative process. Once testing of the current first iteration has taken place, analysis of feedback will be taken into evaluation and review which will lead to iteration 2. This process repeats as seen in figure 2.5 until the tool has been fully refined through analysis of feedback.

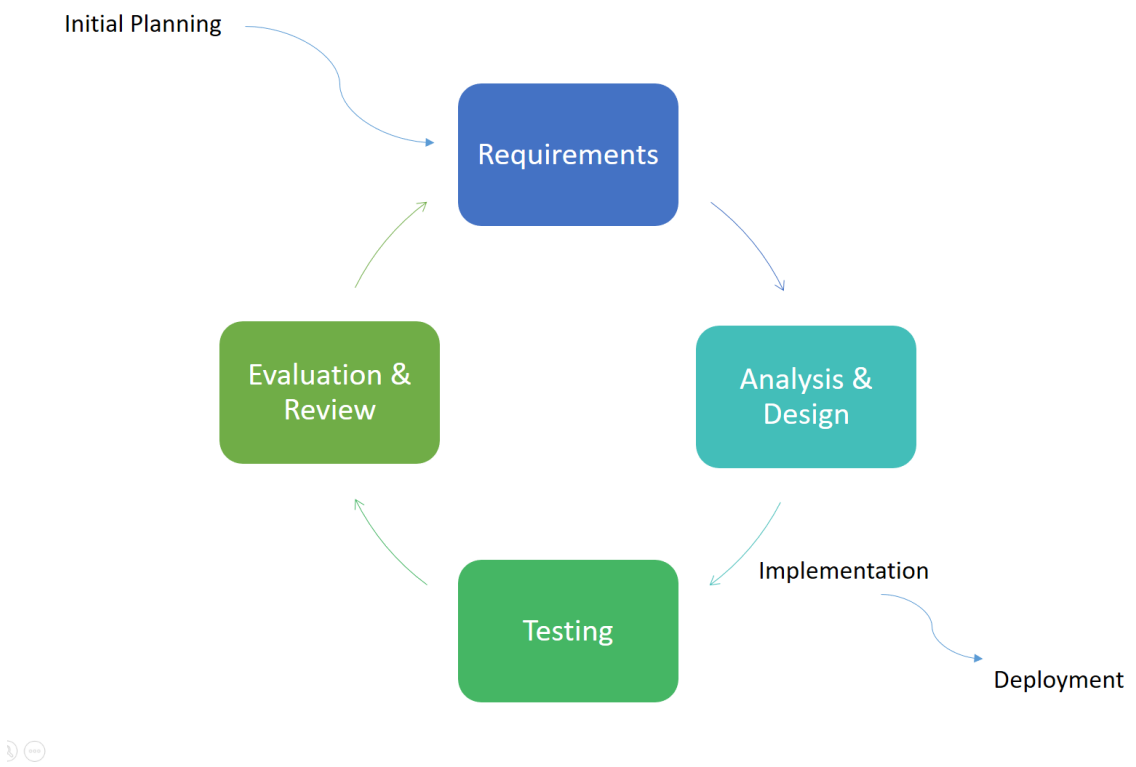


Figure 2.5 The Iterative process model adapted from Interaction Design Foundation (2020)

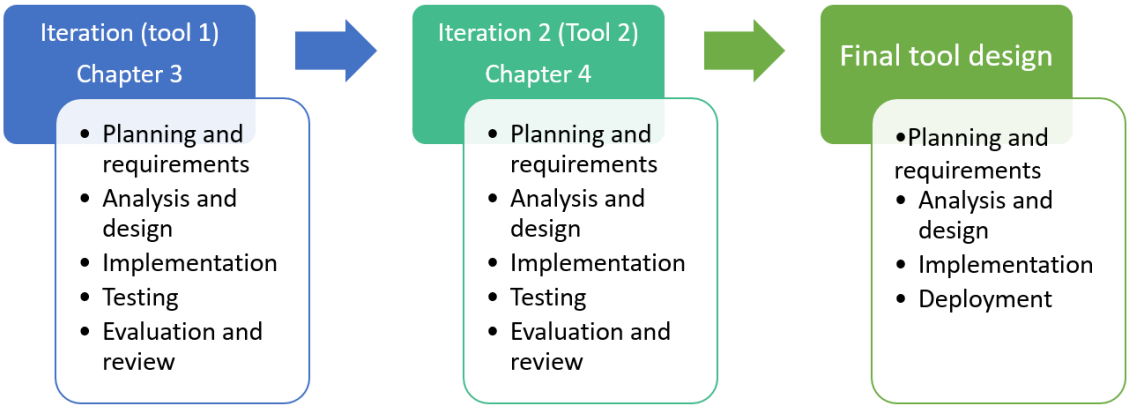


Figure 2.6 The Iterative process adapted to evaluate the current tool designs as discussed in their respective chapters, model adapted from Eby (2019)

2.5 General Research Methods

The implementation and testing of the tool were carried out with preliminary pilot evaluation studies (Thabane et al., 2010). Small scale pilot study methodologies allowed the evaluation and usability of the tool to be tested before a large-scale study was carried out. This ensured that the tool was effective in the collection of wellbeing data and was fit for its purpose (Van Teijlingen & Hundley, 2001). The nature of a pilot study meant that tool data collected from the tool implementation was not intended to be analysed to understand participants' wellbeing in relation to spending time in green spaces (Breakwell et al., 2006). Although participants' measures of mental wellbeing were collected, this data was not examined, as it was not applicable to improving tool usability. The study focus was on testing the way the tool was designed to be used, and whether it facilitated the collection of data and specific feedback on participants' experiences of the tool. Redesigning the tool through the iterative process allows the tool to be tested, reviewed and improved after each pilot study.

The data collected in the pilot studies was focused on feedback from the survey detailing the participants' experiences and in evaluating the tool. This was collected from the feedback questions throughout the survey, open text box feedback questions and follow up interviews. The participant feedback was both qualitative and quantitative in nature and analysed using mixed-methods approaches to data collection. This method allowed for the triangulation of data (Adams & Cox, 2008) resulting in stronger evaluation by allowing 'the strengths of each strategy to be combined in a complementary manner' (Teddlie & Tashakkori 2009). This collection of both quantitative and qualitative feedback helped to determine the feasibility of using the tool and identify implementation issues.

Data analysis of qualitative data including the within survey feedback and follow up interviews was analysed by means of content analysis (Hsieh and Shannon (2005) and thematic analysis (Braun and Clarke (2006). These analytic methods are applied to data throughout this thesis for both the tool evaluation and for evaluation of the green space project development at Ysbyty Ystrad Fawr. As these analytical techniques are used consistently throughout the thesis, the methodological process' are detailed here.

2.5.1 Content Analysis

Data from the open text box feedback was analysed by content analysis. Defined by Hsieh and Shannon (2005) content analysis is, "defined as a research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns". This method allows qualitative text data to be coded and categorised into explicit categories from surface-level information which can be described using statistics.

The open text box feedback was analysed using conventional content analysis which allows the codes and categories to be discovered from reading and the text. This is a strong data analysis method as direct information from study participants is collected and categorised without using preconceived categories. It helps to avoid analysis bias (Smith & Noble, 2014) reducing the influence of any personal beliefs and influences held by a researcher who is aware of data that support the hypothesis, reducing inconsistencies.

The analysis procedure as described by Hsieh and Shannon (2005) and has been adapted into 7 phases for conventional content data analysis see Table 2.1.

Table 2.1 The seven phases of conventional content analysis, descriptions directly from Hsieh and Shannon (2005)

Phase 1	"Reading all the data repeatedly to achieve immersion and obtain a sense of the whole… read word by word to derive codes"
Phase 2	"highlighting the exact words from the text that appear to capture key thoughts or concepts"
Phase 3	Initial analysis, make notes of first impressions.
Phase 4	"labels for codes emerge that are reflective of more than one key thought"
Phase 5	"codes then are sorted into categories based on how different codes are related and linked"
Phase 6	"Next, definitions for each category, subcategory, and code are developed"
Phase 7	"to prepare for reporting the findings exemplars for each code and category are identified from the data… researchers might decide to identify the relationship between categories and subcategories further based on their concurrence, antecedents, or consequences"

The researcher ensured all these steps were followed when conducting the conventional content analysis. Usually, coding is cross-checked by a secondary coder to ensure the reliability of analysis (Scott, 1955) however for this research the data was only coded by one researcher. It is recognised therefore that this researcher collecting, coding and analysing the data could be prone to analysis bias (Smith & Noble, 2014) or researcher bias (Onwuegbuzie & Leech, 2007). Therefore to account for the lack of a secondary coder, the data analysis for each content analysis was repeated at two separate time points.

2.5.2 Thematic Analysis

Data from semi-structured interviews and feedback from social media was analysed by thematic analysis as a more in-depth method of analysis was needed. Thematic analysis is a process of data analysis for qualitative data such as interview transcripts. It is similar to content analysis in that qualitative data is analysed by organising the data into themes, however, in a thematic analysis the themes are not statistically analysed, instead are described in detail and interpreted (Clarke & Braun, 2014). This type of analysis is flexible in that themes are also not dependent on their frequency of appearance in the data but on whether the theme captures key points in relation to the research question (Braun & Clarke, 2006). Thematic analysis can be Inductive "bottom-up" or deductive "top-down", Inductive analysis codes the data without a preconceived frame (Braun & Clarke, 2006) therefore as this is a pilot study this approach was taken when analysing the qualitative data. Terry et al. (2017) discuss the strengths and limitations of the thematic analysis framework noting that although this type of analysis allows flexibility to be used with different types of data and it is flexible in that the researcher can choose which data is most influential in the interpretation, the quality of data analysis and interpretation can be an issue. This is similar to the issue of analysis bias (Smith & Noble, 2014) and researcher bias (Onwuegbuzie & Leech, 2007) as above with utilising content analysis as a strategy. Once again the researcher presently aims to reduce bias by repeating the thematic analysis at different time points, in an attempt to ensure the data is analysed thoroughly. Braun and Clarke (2006) described guidelines for the thematic analysis procedure with six phases as seen in Table 2.2.

Table 2.2 *The six phases of thematic analysis as described directly by Braun and Clarke (2006)*

Phase 1: Familiarisation with Data	Transcribing data (if necessary), reading and re-reading the data, noting down initial ideas.
Phase 2: Generating Initial Codes	Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code.
Phase 3: Searching for Themes	Collating codes into potential themes, gathering all data relevant to each potential theme.
Phase 4: Reviewing the Themes	Checking if the themes work in relation to the codes extracts (Level 1) and the entire data set (Level 2), generating a thematic 'map' of the analysis.
Phase 5: Defining and Naming Themes	Ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells, generating clear definitions and names for each theme.
Phase 6: Producing the Report	The final opportunity for analysis. Selection of vivid, compelling extract examples, the final analysis of selected extracts, relating back of the analysis to the research question and literature, producing a scholarly report of the analysis.

2.6 Conclusion

Subsequent chapters will detail the individual pilot studies designed to test and evaluate the wellbeing tool. Within these chapters (3 and 4) pilot studies' individual study design methodology, ethical consideration and data collection and analysis are presented

.

Chapter 3 Phase 1 - Tool Iteration 1

3.1 Chapter Introduction

This chapter describes the evaluation of tool iteration 1 used on Cardiff University staff as subject participants. Participants reported their state of wellbeing using the tool in a longitudinal study and feedback was requested throughout to collate their usage experience of the tool. Data was collected using feedback survey questions and participant follow-up interviews. This feedback facilitated the subsequent tool design iteration.

3.2 Specific Research Methods

3.2.1 Research design

The focus of Phase-1 is to collect feedback on survey tool iteration 1 for refinement and use in a larger-scale study. This study aimed to test out the tool and to collect feedback on the study design, usability and attitudes towards the tool. Wellbeing data was collected from participants, with feedback responses and data from follow-up interviews being the focus of this research, as Rogelberg et al. (2001) described collecting attitudes towards surveys as leading to high-quality data.

The objectives of this study were:

- To carry out a longitudinal study using the research tool to assess subjects before and after they spent time in green spaces.
- To collect data from the feedback sections of the tool.
- To carry out follow-up interviews and collect qualitative data on the participant's experience of the longitudinal study and study design feedback.
- To evaluate tool iteration 1 using feedback and follow up interviews from the longitudinal study design.
- Redesign the tool informed by the study analysis to create tool iteration 2.

A mixed-methods approach was taken for data collection and analysis. Qualitative and quantitative data triangulation was used to validate the data collected and verify the reliability of the tool (Chapman et al., 2005, p. 23). The quantitative data was collected through online surveys via

descriptive statistics and qualitative data was collected by survey responses to the feedback questions and semi-structured interviews with participants.

This first iteration of the tool was to be used before and after spending time in green spaces and feedback was collected throughout. The longitudinal study measured wellbeing before and after spending time in green spaces using the tool at multiple points in time. The feedback from participants was then used to evaluate the tool for the next iteration. Rindfleisch et al. (2008) describe how longitudinal study designs are favoured as they reduce common method variance "systematic method error due to the use of a single rater or single source", these studies however also hold limitations as they can be prone to attrition bias.

3.2.2 Research methods

The tool was delivered in the form of an online survey, hosted by JISC Online surveys (as described in 2.2.6). The survey was open from 4th May 2020 to 2nd August 2020 to allow flexibility for participants during the evolving COVID-19 pandemic.

The tool iteration 1 delivered by online survey to participants can be viewed in full in Appendix A.

On the final page of the survey participants were invited to take part in individually arranged follow-up interviews after the survey closed. These took place on two separate dates September 4th and 11th 2020. The interviews were semi-structured and conducted by the researcher with a topic guide (Adams & Cox, 2008)

3.2.3 Study Population and Sampling

As explained in chapter 2 it was not possible to recruit NHS staff due to the COVID-19 pandemic so the participants were recruited from Cardiff University staff who, were all working from home.

This convenience sample (Etikan et al., 2016)was chosen as participants were easily accessible by advertisement. Although this sampling method is prone to bias (population representation being unknown due to characteristics such as high self-selection) (Etikan et al., 2016). However, for a pilot or feasibility study, it was deemed appropriate as these studies do not collect data with any statistical power (Bowen et al., 2009).

Participants were recruited through several different advertising methods to maximise study awareness and potential recruitment.

The advertising was via:

1. Emails advertising the study to staff in the researcher's department (an example advertisement is included in Appendix E)
2. Advertisement of the study on Yammer® staff groups
3. Advertisement of the study in the weekly staff newsletter
4. Advertisement through Yammer® groups for Research and Development staff across the university.

To take part participants had to fulfil the Participant Inclusion Criteria**.**

- Participants must be 18 years old or older, with no upper age limit.
- Participants must be a member of Cardiff University staff, part or full time.
- Participants must be able to give informed consent.

3.2.4 Ethical Considerations

Ethics approval from Cardiff University Research Pharmacy Ethics Committee was granted for the overall project pre COVID-19 adjustments on 30/01/2020 (Appendix B) SREC reference: 1819-25. After COVID-19 amendment to the chosen study population were decided an amendment was submitted and excepted by Cardiff University Research Pharmacy Ethics Committee and ethical approval for this current study was granted on 19/06/2020 (Appendix C).

To ensure the study was ethically compliant interested participants were:

- Emailed a participant number and a copy of the information sheet (Appendix D) to read and subsequently:
- Emailed links to the preliminary and main survey with instructions on use of the survey at their leisure. (These emails were deleted post-study).
- Reminded to review the information sheet before participating in the study. A consent form was included at the beginning of both the preliminary and main survey so that participants had the opportunity to review and give consent before taking part in each part of the study (see Appendix A)
- Reminded that participation was voluntary, and they would be able to decline to answer a question or withdraw from the study at any time.
- Informed of the interviews in the information sheet at the beginning of the study, participants were sent a consent form (See Appendix F) specifically for the interviews was created and sent to participants if they expressed an interest in participating in the follow-up interviews.

All personal data collected and audio recordings from the interviews were handled and stored securely in accordance with Cardiff University's Data Protection Policy.

3.2.5 Research procedure

After the advertisement, participants contacted the researcher via email and were emailed the study information sheet and assigned a participant number. Participants and assigned participant number key codes were kept in a secure document only accessible by the researcher. The participant numbers were distributed to ensure pseudo-anonymity and allow the survey data to be compared before and after the green space interaction for each individual participant.

Participants were then sent two links to online surveys including a preliminary survey and the main longitudinal survey. Participants completed a preliminary survey once at the beginning of the study to collect basic demographic information and a baseline measure of wellbeing (see Figure 3.1). Consent pages were included at the beginning of both surveys in the form of a tick box.

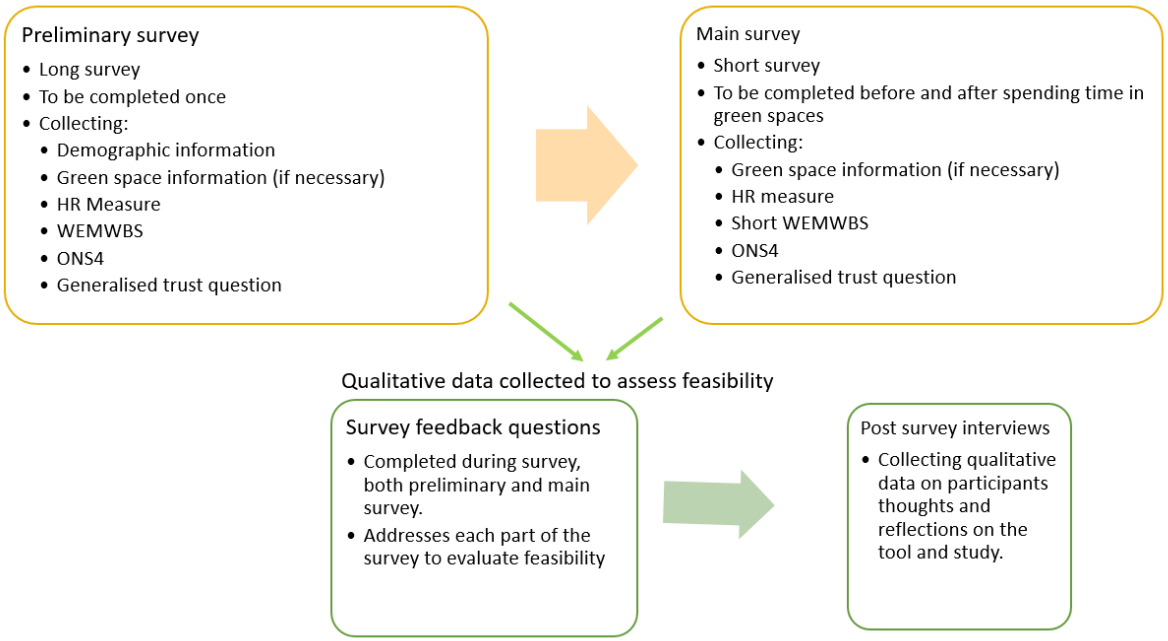


Figure 3.1 Stages of survey completion (yellow) and sections for data collection (green)

The main survey was then completed immediately before and after whenever spending time in a green space (pre and post-intervention).The differences between the preliminary survey and the main survey can be seen in Figure 3.1. This survey design including a preliminary survey and main survey ensured participants did not have to repeat their demographic information every time and maximised

efficiency and longitudinal survey completion. It was then easy for the participant to complete a shortened survey both before and after spending time in a green space.

The main survey used the same link for both before and after spending time in a green space, with a question asking if the participants were completing the survey before or after spending time in green spaces (please see Appendix A for reference). If participants completed the main survey before spending time outside, they were directed immediately to the physiological measures of wellbeing section, however if they had spent time outside they completed the green space information questionnaire before continuing to the physiological wellbeing section.

As described above after participants completed all sections of the surveys participants were invited to take part in the follow up interviews. A hyperlink to a page where participants could input their email addresses to take part was provided (as seen in Figure 3.1).For participants who responded with interest by the researcher after the survey closure (2nd August 2020)

The researcher:

- Confirmed the individual's interest in the interviews,
- Sent the information sheet (Appendix D) and consent form (Appendix F) specific to the follow-up surveys
- Arranged an interview time.

Prior to the interview all participants:

- Signed and returned the consent form to the researcher
- Were provided with a reminder of the survey structure (Appendix A)

A topic guide (Appendix G) was created to direct the semi-structured interview and open-ended questions were asked to allow participants to share their thoughts in their own words. Semi-structured interviews were chosen to allow the participant to feel at ease to communicate their experience of the survey and reveal important and relevant issues in the tool. This approach to conducting interviews is advised by Adams and Cox (2008) supporting the use of the topic guide to steer the interview which allowed the interviewer to ask questions related to each different stage of the research study whilst maintaining the apparently 'free flow' of the participant's responses.

The interviews were conducted remotely via Microsoft Teams® due to COVID-19 restrictions and used audio-only to maintain some anonymity. Prior consent was obtained via the information sheet and consent form for the audio recording using a separate Dictaphone. The interview began with reviewing the consent form and with thanks for taking part in the whole study process. The participant was then asked to review the survey structure document and prompted to ask questions or clarify any confusion. The interview continued guided by the topic guide, influenced by the stages of conducting an interview advised by Adams and Cox (2008) and finished with thanks and a final question asking if there was anything else the interviewee wished to discuss. The recording was stopped and the participant asked if there were any further comments they wished to make unrecorded. All interviews ended with a final thanks for participation.

The ad verbatim recording transcript was completed immediately after the interview took place and was checked against each audio recording to ensure accuracy (Widodo, 2014). The recording of each interview was deleted once the transcript was completed to maintain subject anonymity. An example transcript from one interview is included in Appendix H.

3.2.6 Data collection and Analysis

Quantitative data was collected from multiple points in the feedback sections containing open text boxes and Likert scales.(table 3.1).

Table 3.1 Demonstrating the data collection points of open text box feedback (green) and smiley face questions (yellow) from each section of the surveys for both the preliminary and main survey types.

<table>
<tr><td></td><td colspan="5">Survey Section</td></tr>
<tr><td>Survey Type</td><td>Demographic information</td><td>Green space</td><td>WEMWBS/ SWEMWBS</td><td>ONS</td><td>Social trust</td></tr>
<tr><td rowspan="2">Preliminary survey</td><td colspan="5">Open textbox feedback</td></tr>
<tr><td colspan="2"></td><td colspan="3">Likert Scale Smiley face questions</td></tr>
<tr><td rowspan="2">Main Survey</td><td colspan="5">Open textbox feedback</td></tr>
<tr><td colspan="2"></td><td colspan="3">Smiley face questions</td></tr>
</table>

The open textbox feedback from the survey was analysed by a conventional content analysis (Hsieh & Shannon, 2005) using the phases described in (chapter 2.5.1). This provided the best analysis as it

categorises surface-level data and finds themes lead by the data. The data collected from the feedback sections regarding the Likert Scale smiley faces were collected along with the open text box data and presented graphically.

Data collected from the transcribed interviews were analysed by an inductive Thematic analysis (Braun & Clarke, 2006) using the phases described in (chapter 2.5.2). This provided a more detailed analysis method within which themes could be interpreted then used to analyse small data sets in depth.

3.3 Results

3.3.1 Survey Response Rate and Respondents' Demographic information

18 participants responded to advertising and requested participation in the study. 11 participants completed the preliminary and 10 people completed the main study. Of the 10 participants, 2 agreed to take part in the post-survey interviews. Table 3.2 shows the demographic information collected from the preliminary survey.

Table 3.2 Demographic information of preliminary survey respondents (n=11)

Age range	**25-64**
Gender	Female N=10 Male n=1
Employment	Full time N=9 Part time=2

3.3.2 Open text box feedback

Table 3.3 demonstrates the open textbox feedback analysed by content analysis, including categorised codes, frequency of codes and examples *ad verbatim* from the survey. The frequency of codes was quantified by specific times a certain word was mentioned in the open text boxes, offered to the participant as seen in table 3.1. Whilst many of the comments were themed as positive, participants also feedback with attitudes around the smiley faces, issues with the HR monitor, issued with screen time, green space and the social trust question (table 3.3)

The theme of positive comments arose from the content analysis. Data categorised as “positive comments” in the content analysis have been quantified in figure 3.2 demonstrating which comments were given in each survey section of both the preliminary and main survey. Feedback most frequently and commonly given from participants completing the WEMWBS and SWEMWBS suggested the survey was ‘easy’ and ‘quick’.

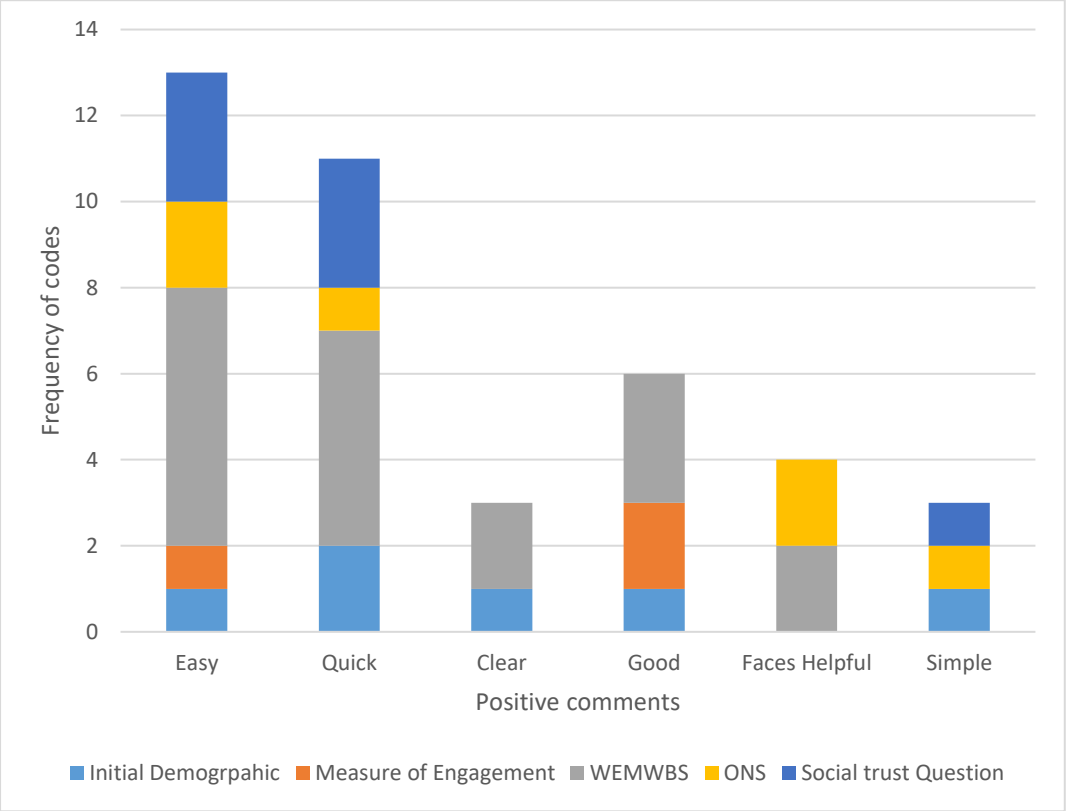


Figure 3.2 Bar graph quantifying the data themed as ‘positive comments’ by the content analysis in table 3.3.

Table 3.3 Content analysis from the open text boxes in both the preliminary survey (n=11) and the main survey (n=10).

Category	Code	Frequency of comment	Examples from ad verbatim quotes
Positive comments	Participants gave positive comments around the survey	40	• Easy • Quick (as seen in Figure 3.2)
Social trust	The social trust question was not specific enough	2	• Very broad question! I would generally trust people I met on the street, but not trust anyone on the internet! • The question about trustworthiness is so vague. It would depend on whether I have been chatting with my neighbour or looking at Twitter just beforehand!
Green space	A need to define engaging with green space	1	• Define "engaged" with the green space. I can guess at a definition, but again, this is subjective
	Should collect information on the kind of location someone lives in	2	• Perhaps could collect basic information on the kind of environment one lives in -- if someone lives in e.g. a flat, would they get more benefit from using green spaces than if they live in a large house far away from others? • Maybe ask about location and distance to green spaces. Also, ability to access green spaces eg. walkable, by car public transport etc
Heart rate (HR) issues	HR could be influenced by physical activity	2	• Maybe ask about general physical activity rating? sedentary to very fit?

			• The heart rate monitoring - I have just come back from a fast walk around the park, and my heart rate is higher than before, but I haven't recovered from the exercise. Should the heart rate be taken a set time after the time in the green space? Or a note be made if physical exercise was undertaken?
	Participants didn't want to add more apps to their phone	1	• Did not want to do the heart rate as the phone is already old and slow and did not want to add additional Apps
	The ability to use a personal HR monitor e.g. Fitbit would be helpful	2	• On the previous page, I wouldn't measure my own HR. When I have my Fitbit on I can check and add my HR, otherwise, I wouldn't, sorry! • For the page before, might be useful to add something like if you have a Fitbit you can take the info from there?
Screen time	Participants did not want to spend time completing the survey on a screen	2	• In general, the last thing I want to do after spending time outdoors is switch my laptop on to fill in the survey! So this is filled in retrospectively. Not sure how it will impact your data. • I am filling this in now (before and after) but the exercise happened yesterday, so I am trying to remember. As said previously, I never think to fill it in actually before exercise, and I don't want to switch on the laptop when I come back, counteracts all the good!
Smiley faces	Smileys viewed positively	6	• Like this format, with numbers and faces. • The smiles are helpful to highlight the answer options
	Smiley viewed negatively	9	• Faces did not seem appropriate, preferred number scale. • Preferred numbers to answer these types of questions.

3.3.3 Feedback questions addressing the Likert Scale smiley faces

Attitudes towards the smiley faces used in the survey are presented in Table 3.4 and interpreted in figure 3.3. and 3.4. While generally viewed positively, most respondents would not wish them to be the only way to record this information.

Table 3.4 Frequency of responses to, Likert smiley face response questions

Survey type	Likert Smiley Face Response Questions					
	Did you find the smiley faces helped you in providing your evaluation in this section?			*Would you prefer to use the faces alone without the number scale?*		
Main	Yes	No	Don't Know	Yes	No	Don't Know
	23	7	1	8	21	2
	17	11	3	6	22	3
	11	17	2	3	26	2
Preliminary	10	1	0	0	10	1
	5	4	0	1	8	1
	4	5	0	0	9	1

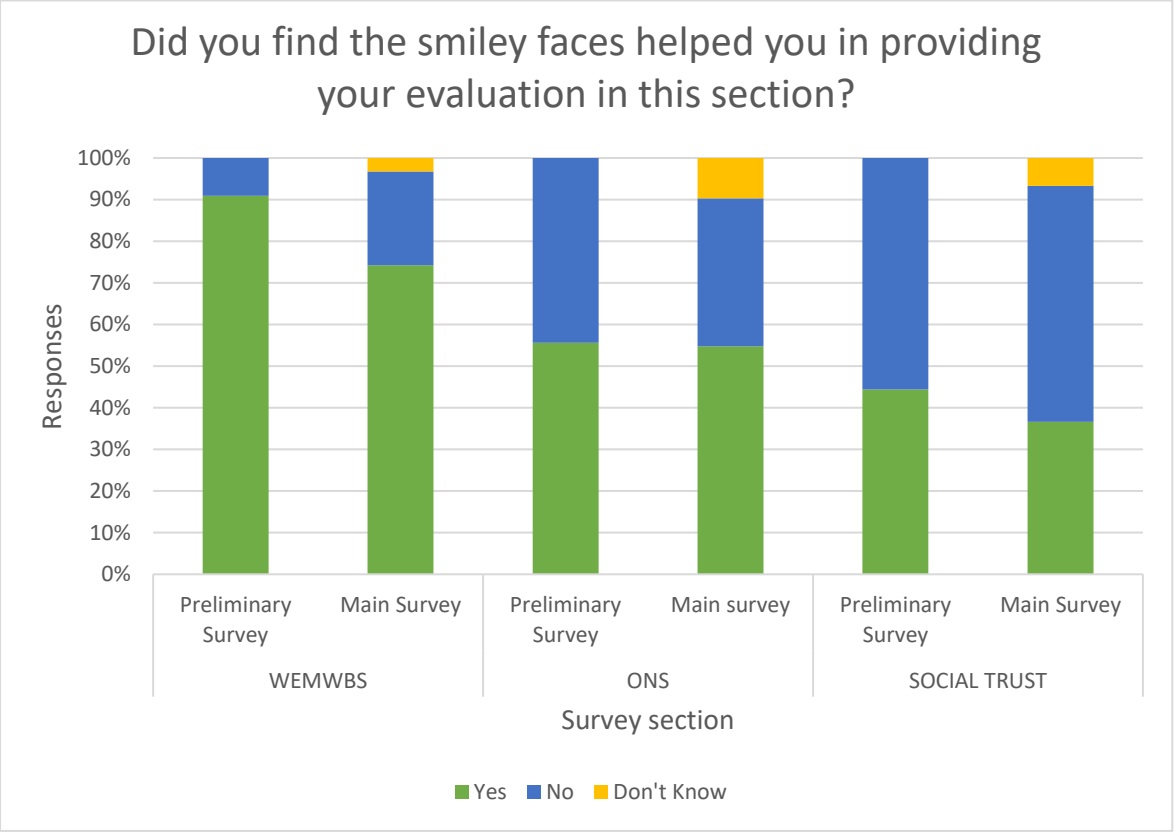


Figure 3.3. Feedback answers to 'Did you find the smiley faces helped you in providing your evaluation in this section?'

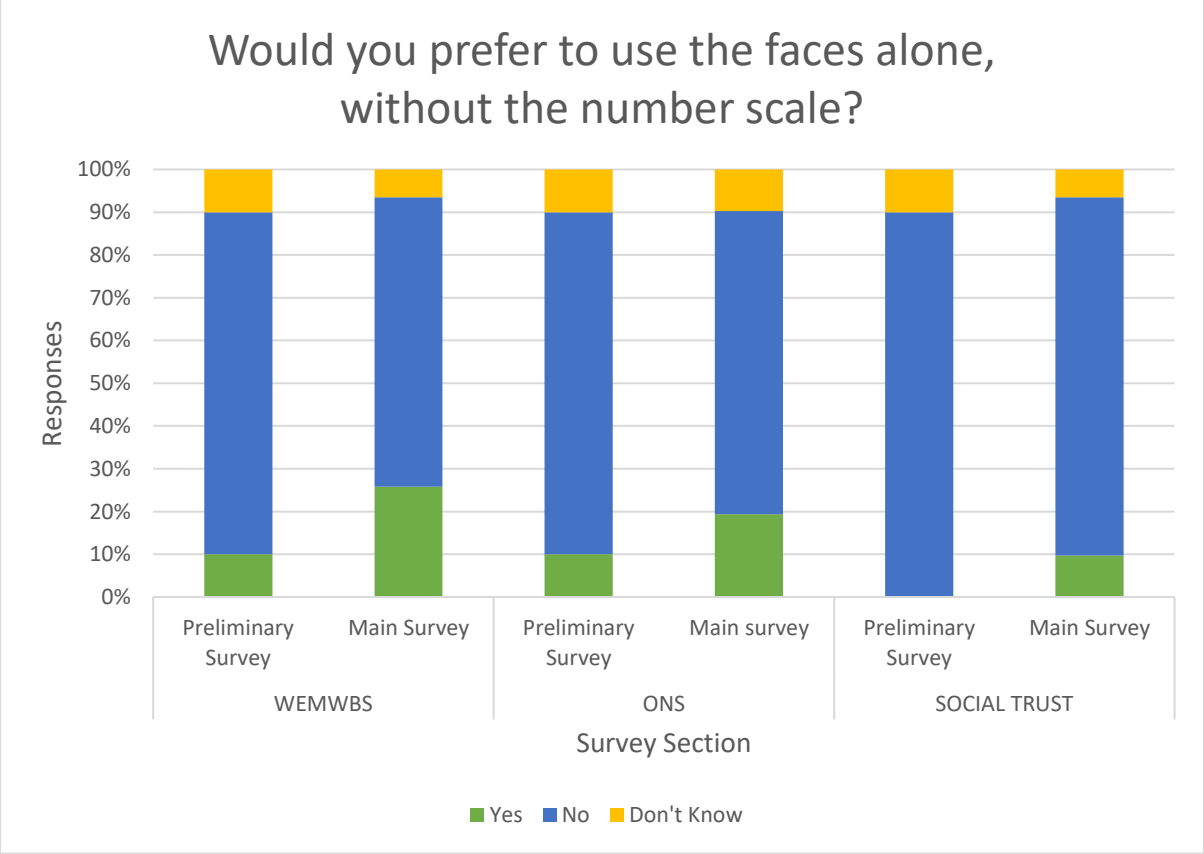


Figure 3.4. Feedback answers to 'Would you prefer to use the faces alone without the number scale?'

3.3.4 Follow up Interviews

The resulting themes from the thematic analysis of the two semi-structured follow-up interviews which were undertaken are summarised in Table 3.3 and interpreted below. Key findings are interpreted further in the discussion of this chapter (3.9)

Table 3.5 Themes emerging from the Thematic analysis of semi-structured follow up interviews.

THEMES
a. Personal interest in green spaces
b. Social trust question issues
c. Difficulty with pre and post-intervention
d. Activity within the green space

a) Personal interest in green spaces

From the interviews emerged the theme of personal interest in green spaces as participants commented they liked the topic area and suggest a possible bias issue here, how participants who like going outside and are aware of the benefit are more likely to reply to the questions as this study reflect their interests.

> *"it's a really nice topic, predisposes you to reply to the questions."*
> *"I don't know if you introduce a bias by encouraging people to go outside."*

Another bias-related point raised from the interviews was that as spending time in green spaces is necessary for the completion of this study, the people likely to complete the survey would be the ones that often visit green spaces and have access to them.

The survey itself addressing wellbeing may introduce bias, compared to a general population as noted in one interview.

> *"Having to think about these questions makes you assess your wellbeing, and put more work into it."*

This is a key point as participants had to regularly assess their wellbeing, meaning that they might put more effort into improving their wellbeing.

b) Social trust

The social trust question was raised in the interviews as a challenging part of the survey. This question appeared to be difficult for participants as it was not specific about which social setting they should apply this question to, whether it be direct personal interaction or social media interaction.

> *"Open to interpretation wide range of answers people have in their minds when answering this."*
>
> *"Trust question was difficult to answer, are you talking about people on Twitter? You can't trust anybody. The local shop? You can trust 9 out of 10 people, not 9 out of 100 so it's difficult to evaluate overall judgement with how trusting you are with people."*

c) Difficulty with completing both before and after visiting green spaces

Results from the interviews suggested participants struggled with completing the survey directly before and after spending time outside.

> *"Didn't complete it as many times as wanted to as with the dog getting excited about a walk sometimes there isn't time to complete this. But don't think making the questionnaire shorter would have helped this. I don't think that could get round life happening even if there was a questionnaire that could be answered instantly."*

This participant struggled to complete the survey before going out as they were walking their dog and couldn't find time to complete it before going outside.

> *"I felt happier completing afterwards than getting it done before."*

This participant also noted that it was easier to complete the survey after spending time outside rather than before.

> *"Majority of the times I filled in the survey a couple of days later when I remembered. So it was me trying to remember how I felt after coming back."*

This participant found it difficult to remember to complete the survey before and after spending time outside and would answer the questions retrospectively instead of directly before and after spending time in a green space.

d) **Activity within the green space**

The results from the interview showed there was concern about how physical activity and stress can affect the HR measure and lead to misleading data.

> *"some of the time in green space I was going for a strict walk in the park and the Heart rate would be up because of the exercise but wouldn't say that that was measuring stress level I'd say it was measuring exercise level."*

This issue raised in the interviews could have effects on the measurement of stress levels by HR and the value of the inclusion of this in the tool. However, a potential solution to this was also suggested.

> *"should have had a question asking how have you enjoyed your green space, by exercise, resting etc … could give misleading answer without this information."*

By collecting information on what activity people took part in in the green space, changes in HR measurements can be understood. This would also be important information understanding how different people engage with different green spaces given that there are:

> *"many ways for people to engage with green spaces and utilise green spaces in lockdown"*

By collecting this information on how people are engaging with their green spaces, it could lead to a better understanding of participants' wellbeing as many factors contribute to our wellbeing, mental, physical, social.

3.4 Discussion

This phase 1 longitudinal pilot study aimed to test out the preliminary iteration of the tool by collecting feedback from participants on the survey and study design. Follow-up interviews collected detailed data on participants' experience of using the survey. The participant open textbox feedback was analysed by content analysis and the follow-up interview data was analysed by thematic analysis. These results have led to recommendations for survey improvement for tool iteration 2.

Study Design

A key finding from the results of the open text box feedback was that participants reported a positive view of both the preliminary and main survey. Participants commented that the survey was 'Quick' and 'Easy' to use. These comments support the current design of the questionnaire demonstrating that participants liked the survey and overall layout. As Adams and Cox (2008) describe: a short questionnaire will help to minimise participants skim reading or misinterpreting the questions and

helps with motivation to complete the survey. They also describe how short questionnaires help minimise answer repetition, long questions increase the likelihood of repeating previously given feedback. The tool requires participants to repeat the survey pre and post-intervention (before and after spending time in green space) and these results confirm that the survey is quick and easy enough for this repetition to encourage motivation to complete the survey. This also reduces inaccurate data that could arise from long survey completion. Another strength of this study includes the collection of qualitative and quantitative data from questionnaires and qualitative semi-structured follow-up interviews. This mixed-methods approach is a strength as it allows for triangulation of descriptive data (Adams & Cox, 2008; Schmidt, 2004). This will aid decisions on the redesign for the new tool iteration as data is stronger when being collected with a mixed-methods approach. Nevertheless, results from the content and thematic analysis indicate several issues and challenges indicating that the survey can be improved. It can be concluded that although participants gave positive feedback there are still areas that may need adjustment.

For instance, the results suggest issues with the study design. One participant fed back that they found it difficult to remember to complete the survey after and particularly before spending time in the green space therefore, would retrospectively fill out the survey. If this pilot study was measuring the impact of green spaces on wellbeing and not just piloting and evaluating the tool then this would result in a protocol deviation and would not be included. This longitudinal study design was chosen as the best way to measure wellbeing before and after spending time in green space. The result suggests that it may not be feasible for all participants to complete the self-report survey in a natural setting. However, this was noted by one participant (out of ten), therefore, is noted as a point of interest but does not necessitate study redesign. The feedback does however suggest the need for clearer instructions on experimental procedures and that measuring wellbeing directly before and after intervention could be difficult for some participants.

Previous research investigating green spaces using the before and after method of measurement has rarely been completed in a natural setting with self-response surveys. Researchers are often present with the participants when the green space intervention is undertaken and feedback is collected, as seen in a study conducted by Chiumento et al. (2018) examining wellbeing before and after a horticultural intervention. Van den Berg and Van den Berg (2012) describe how when examining the health benefits of green space, before and after studies generally provide weak evidence due to the lack of a control group to compare it to. This is a valuable consideration for the current study design as tool iteration 1 did not account for a control group. This could be a significant limitation in the study design and should be implemented in future cross-sectional large scale studies. Nevertheless, this current tool was designed to be used as a before and after measure in a longitudinal study which Van den Berg and Van den Berg (2012) describe as a more rigorous research design. This allows for cause

and effect to be more distinguishable with longitudinal studies measuring events in temporal sequence, therefore, a control group is not essential.

Green Space Engagement and Activity

The second key result from this present study related to green space and HR measures. Participants suggested collecting information on additional characteristics of green space to account for possible variability of HR measurements and wellbeing.

The current tool iteration aimed to collect self-reported general information on levels of engagement and time spent in the green space. Participants were asked; How long did they spend in the green space (White et al., 2019); how much did they engage with the green space and did they spend their time engaged with the green space and not distracted by work (Richardson et al., 2016). These questions were originally chosen to suit the population of NHS staff at Ysbyty Ystrad Fawr hospital (YYF) to measure wellbeing in the developed green space (Chapter 5). However, the participant population, in this present study were asked to use their own local green spaces during the COVID-19 pandemic. For participants green space was, defined as a 'vegetated space' therefore could present variability in the research as the green space was not standardised. Future studies collecting information on green space characteristics could be useful data to determine variability in the results however, this would require a much larger sample size to demonstrate statistically significant effects. As mentioned in 2.2.3a, Green space characteristics, location and experience can be measured in many ways (Kondo et al., 2018). By adding questions to the next tool iteration defining green space locality and how time in the green space was spent, inferences could be made around the effects of green space on wellbeing.

Investigating the kind of activity undertaken in the green space would provide information around levels of physical exhaustion. The results from this current study showed that participants were concerned that measuring HR would lead to inaccurate stress levels. (It should be noted a limitation of this study was that the feedback section was not added directly to the HR measure, due to human error, however participants responded to the HR measure in the next available feedback box.) Responders felt that going outside in green space would increase their HR score simply because they were moving from sedentary to active. This is a limitation in the original tool design and when compared to a study by Park et al. (2010) finding HR scores lowered after approximately 15 minutes of walking in a forested area, the current study did not consider cross-checks and control stimuli. The 2010 study was tightly controlled for participants, exercise loads, distance from green space intervention and background environmental conditions such as meals and caffeine consumption. Although this current phase of the pilot study is not able to control exercise loads and green space locality in the same way, it is recommended that the next iteration includes questions asking

participants about their current fitness level and what exercise and engagement they have undertaken in the green space as this may help to interpret the HR data collected.

Social Trust Question

The Social Trust question was questioned for its appropriateness within this tool. The results of this study show that participants found the social trust question and scale confusing. This question although supported by research linking social trust with subjective wellbeing (Delhey & Dragolov, 2014; Sarracino, 2010) was found to be too vague by many participants. The social climate may have had an impact on participants who responded to this question due to changeable local lockdowns, social distancing and self-isolation measures in place during the COVID-19 Pandemic (Gaeta & Brydges, 2021). However, this interaction may be more complex than originally thought as evidence shows that social trust had both positive and negative associations with social distancing (Woelfert & Kunst, 2020). Whilst evidence has shown an interplay between social trust and wellbeing (Churchill & Mishra, 2017), the present research findings have indicated that using a singular question to measure the social aspects of wellbeing may not be appropriate. The social trust question was originally added to capture the social dimension of wellbeing, however, the results from this study indicate that the question selected was not appropriate and that questions within the WEMWBS such as 'I've been feeling interested in other people' and 'I've been feeling close to other people' capture this social aspect as part of subjective wellbeing measures. It therefore can be concluded that the social trust question is not appropriate for this tool and that it should be excluded in further iterations.

Smiley Face Likert scales

The results from the survey feedback questions found mixed results for the use of smiley faces with the Likert scales. These results (3.3.3) showed that the majority of responses indicated that smiley faces were helpful but not particularly liked. The majority of responses liked using the smiley faces to respond to the WEMBWBS and SWEMWBS measure, 91% of Preliminary study responses WEMWBS (n=10/11), 74% of Main study SWEMWBS (n=23/31). This is consistent with research supporting the use of smiley faces or emojis as a response for a Likert scale (Emde & Fuchs, 2012; Kiliç et al., 2021). However, smileys were preferred for the WEMBWBS question by 0% (0/11) for the Preliminary study, by 26%, (n=8/31) for the Main study, SWEMWBS.

Fewer responses found the faces helpful for the ONS4 question 55% of Preliminary study responses (n=5/9) and 56% of Main study responses (n=17/31) while Smileys were preferred for the ONS4 question by 10% (1/10) for the Preliminary study and by 19%, (n=6/31) for the Main study.

Most responses indicated that participants did not like using smiley faces to answer the Social Trust Question, only 44% were liked in the Preliminary study (n=4/9) and 37% in the Main study s (n=11/30) Preliminary study responses n=10/11, 91%, Main study n=23/31, 74%).

These findings suggest that not all wellbeing questions are well-suited to match the smiley faces icon responses. As participants liked the smiley faces with the WEMWBS and SWEMWBS but not the ONS and Social trust question, this cannot be solely due to participants not liking the smiley faces. The universal preference for another icon/grading image indicates that a different icon may be more appropriate. An explanation for the faces only working well with the WEMWBS and SWEMWBS could be due to the Likert scale being a 5-point scale matching with the 5 smiley faces but that both the ONS4 questions and the Social trust question having an 11-point Likert scale therefore not directly matching the 5 smiley faces. This was noted in the creation of the tool, however, creating an 11-point smiley face could be confusing as mentioned by Toepoel et al. (2019) using more than 5 emojis can be difficult to illustrate meaningful scale graduation and so the 5 smiley faces were matched to the 11-point scale for participants to use as a reference. It could be that participants preferred the 5-point Likert scale overall. Garratt et al. (2011) found that 5-point scales were preferred to 10-point scales when evaluating satisfaction with patient experience. These results also showed that although participants found the smiley faces helpful the majority did not want to complete the scale with the faces alone (without the number scale too). This concurs with the inconclusive evidence assessing whether smiley faces or emojis can replace traditional numerical or written Likert scales (Elfering & Grebner, 2008; Toepoel et al., 2019) and suggests that although they might be helpful the faces may be too subjective in interpretation. However, as discussed by Alismail and Zhang (2020) this could also be due to subjectivity within the numerical scale so may indicate a more systematic issue. Other issues including preference towards a numerical scale or whether participants thought the faces were appropriate with the wellbeing questions must be considered in future studies.

Potential Selection Bias

The final key finding that demonstrates a limitation in this study is the suggestion of biases. This study has a study small population(n=10) which is common in longitudinal studies (Rindfleisch et al., 2008) and pilot studies. Although longitudinal research has strengths in its ability to collect multiple data sets, it is also liable to fall to responder bias. Responder bias as described by Hazel et al. (2016) is when:

"those who responded to the survey and those who did not respond differ in some way related to the phenomena, leading to bias in interpreting responses as representative of the whole population".

Utilising a convenience sample from Cardiff University staff, provided participants bias due to the selection of a specific population. Findings from the interview data indicate that participants who took part in the follow-up interviews have a personal interest in green spaces and therefore are biased towards a positive impact of spending time in nature. A personal interest in the topic area may have influenced motivation survey participation and completion. Rogelberg and Luong (1998) mention lack of interest in the topic area as a reason for non-respondents and could explain the low population

numbers and the fact that the population that did respond demonstrate this personal interest in green spaces. However, it cannot be known for sure whether this is the case. As Richardson et al. (2016) discussed this motivation to take part in research around the topic of green spaces could be due to a greater connection with nature therefore a heightened personal interest. Spending time in nature and engaging with nature has been linked to pro-environmental behaviour (Rosa et al., 2018) and pro-nature conservation behaviours (Cooper et al., 2015) and can be explained by increased nature connectedness (Richardson et al., 2020). This increased nature connectedness could influence motivation to take part in this study more than for those with lower nature connectedness. However, this may not be the case as Nisbet and Zelenski (2013) found that even brief exposure to nature would lead to the temporary promotion of connectedness to nature, suggesting that nature connectedness may not be the driving factor behind participation. As this study used a convenience sample, participants who chose to take part in the study may have also been individuals with easy access to green space and those who regularly use it. A person without access to green space or a person who doesn't visit green space as described by Boyd et al. (2018) would be less likely to take part in this survey as spending time in green space is a requirement. This may mean that the feedback here does not represent a wider population. Johnson (2014) discusses how convenience samples have limited generalisability however, for this study convenience sampling was chosen due to the research limitations in the COVID-19 pandemic. Recommendations for reducing bias in this research include using a control group who do not interact with green spaces for wellbeing. For the new tool iteration, further information is required about the participant's personal interest in green spaces.

Study methods

Further methodological critique involves the limitation of the interviews being carried out online with only audio input. This could affect the interview as the interviewee had no visual input from the researcher however it was implemented to maintain the anonymity of the participant despite the potential impact on the data compared to a face-to-face interview. A final note was the researcher's limited experience at conducting semi-structured interviews in a stressful environment (height of 2020 COVID-19 pandemic). This may have affected the way the interview was conducted as Adams and Cox (2008) discuss conducting interviews as a skill to be refined.

In conclusion, this present phase 1 of the pilot study, evaluating the first iteration of the tool found that although participants liked the surveys and data shows positive feedback throughout, issues surrounding measuring HR, green space characteristics, the social trust question and the prevalence of potential bias due to a personal interest in green spaces were evident. This lead to recommendations for the second iteration of the tool as seen in 3.10. Methodological and study design limitations of this current study were revealed and discussed with recommendations for tool use in larger-scale studies.

3.5 Recommendations for tool iteration 2

The results from this phase 1 pilot study indicate changes that can be made to the next iteration of the tool design. The recommended changes to the tool informed by the results from this study were:

1. Remove the Social trust question.
2. Include a question determining how the participant intends to use the green space.
3. Include a question determining what level of activity the participant is engaged in within the green space to understand HR measurements.
4. Include feedback questions addressing the usability of survey design and personal bias with interest towards green spaces

Chapter 4 Phase 2 - Tool Iteration 2

4.1 Chapter Introduction

This chapter describes the phase 2 of the implementation and evaluation of the revised tool detailed in Chapter 3 and demonstrated in Appendix I. This new iteration (tool iteration 2) was evaluated in an open text box study which gathered feedback from Cardiff University staff and postgraduate students and was used to develop a final iteration of the tool. The evaluation methodology for the new tool was refined from that described in Chapter 3 and the iteration 2 methodology is detailed below.

4.2 Specific Research methods

4.2.1 Research Design

This second phase of the pilot study aimed to test and collect feedback on the revised tool iteration 2, (Appendix I). This new tool was designed to be used before and after spending time in green spaces and this study part was focused on collecting feedback on the revised survey questions and survey layout. A repeatable cross-sectional study design was used for data collection at single time points. The tool could thus be employed at a single time point or before and after green space interaction as desired / able. It was felt that this design would be more accessible to subjects and encourage participation.

The objectives of this study were:

- To collect data from the feedback sections, open text box and final feedback sections of tool iteration 2 using a cross-sectional study with Cardiff University staff and postgraduate students.
- To analyse this feedback to inform the final tool design.
- Informed redesign of tool iteration 2 utilising study analysis to create the final tool iteration.

4.2.2 Research Methods

The tool was delivered as before in the form of an online survey and aimed to collect both quantitative and qualitative feedback from participants. It was hosted by JISC Online surveys (as described in 2.2.6 and 3.2.2) and was open to participants to complete at any time from 17th December 2020 to 25th January 2021 to allow flexibility during the COVID -19 pandemic and evolving local lockdowns.

4.2.3 Study Population and Sampling

Convenience sampling was used to recruit participants as discussed in section 3.2.3. Participants were recruited from Cardiff University staff and postgraduate students through multiple advertising methods to maximise study awareness. Population recruitment was wider than in the previous iteration to increase to increase responder rates and thus the power of the analysis.

An advertisement containing a brief description of the study (Appendix K) with the survey link and the study information sheet (Appendix L) was distributed via:

5. Email to Pharmacy staff
6. Advertisement on Yammer to all Cardiff University staff and postgraduate groups
7. Targeted advertisement via Yammer groups for Research and Development Staff.

The Participant Inclusion Criteria were:

- 18 years old or older, with no upper age limit.
- A member of Cardiff University staff or a Postgraduate student part or full time.
- Able to give informed consent.

4.2.4 Ethical Considerations

Ethics approval from Cardiff University Research Pharmacy Ethics Committee was granted on 16/12/2020, SREC reference: 1819-25 (see Appendix J).

After recruitment, interested potential participants were reminded:

- To review the information sheet (Appendix L) before participating in the study
- To consent via the click 'I consent" box at the end of the online consent form. This was included at the beginning of the survey so that participants had the opportunity to review and give consent before starting. (See appendix I)
- That participation was voluntary and they would be able to decline to answer a question but that as data was anonymised once submitted would be unable to withdraw from the study at a later date.

4.2.5 Data collection

Participants completed the tool at a time most appropriate for them. In order to evaluate the revised tool, qualitative data was collected from one free text box included at the end of each section, (figure 4.1). This free text box asked:

"Please provide some feedback on your thoughts about each section of the questionnaire (e.g. Including ease of completion, time taken, relevance or anything else you think should be included)".

This free text box allowed participants to provide their thoughts on each part of the scale individually allowing more precise evaluation of individual questionnaire sections. Feedback questions regarding the smiley face icons were not included in this study as sufficient data had been collected previously.

Feedback directed questions

A feedback page of specific questions was also added to the end of the survey which collected quantitative data on how much the participant agreed with statements used. Participants were able to respond with a Likert scale of responses:

1. Strongly agree,
2. Agree,
3. Neither agree nor disagree,
4. Disagree,
5. Strongly disagree,
6. Don't know,

The following questions were used:

1. I found this survey easy to use.
2. This survey would be easier if it was in the form of a mobile app.
3. I am not interested in green spaces or the outdoors.
4. I would be happy to complete this survey before and after spending time outside.
5. I would find it difficult to complete this survey both before and after spending time outside.

After each question a text box was added stating 'please feel free to explain why'. This allowed participants to elaborate qualitatively on their quantitative responses.

The questions were created based on the feedback from the previous study and encouraged participants to actively evaluate and feedback about tool iteration 2. The free-text box was also provided to collect qualitative data and more general feedback. The qualitative and quantitative data collection is summarised in Figure 4.1.

Figure 4.1 Survey sections and feedback points for data collection

4.2.6 Data Analysis

Response rates and demographics were collated and presented. Qualitative data was collected from all free text boxes throughout the survey using the Measurement of Green space, Physiological measure of general stress, WEMWBS Wellbeing measure and ONS personal wellbeing measure. A content analysis (Hsieh & Shannon, 2005) was performed on the qualitative feedback as discussed in (Section 2.5.1) this was considered the most appropriate method of categorising and analysing. The feedback directed questions and collated quantitative responses were analysed and presented graphically. The free text box after each question (see Appendix I) was also analysed by content analysis (Hsieh & Shannon, 2005) theming similar data points.

All content analysis feedback was coded based on the appearance of similar words or phrases, which in some cases led to one respondent open text feedback being coded into more than one theme. This is illustrated in the results shown below resulting in frequency codes that do not equate to the number of individual feedback comments given by participants (see Table 4.3 for reference).

4.3 Results

4.3.1 Survey Response Rates and Demographic information

A total of n=32 responses to the survey were obtained from this cross-sectional phase of the pilot study. Table 4.1 demonstrates the demographic information collected. The majority of participants were full-time staff and female with just under a half being in the 55-64 age range category. For the purposes of analysis, each survey completion is counted as one respondent, however as the survey was anonymous, it was impossible to tell if the same respondent completed the survey on multiple occasions. A total of 15 surveys were completed prior to spending time in green space with 17 being completed after spending time in green spaces. As more surveys were completed after compared to before, it suggests that not all respondents used the survey before and afterwards however participants were able to choose whether they completed the survey once or utilised it pre and post spending time in green spaces.

4.3.2 Open text box feedback

The content analysis from the open text box feedback combined qualitative feedback from the Measurement of Green space, Physiological measure, WEMWBS Wellbeing measure and ONS Personal Wellbeing measure. This content analysis does not include the open textboxes from the final page 'Survey feedback' as seen in Figure 4.1. The overall categories emerging from this feedback are as shown in Table 4.2. The category of Positive feedback analysed n=25 responses coded into 'easy', 'clear' 'straightforward' and 'liked the faces'. As seen in Figure 4.2 this simple survey was the most frequently coded response. The other categories and corresponding code frequency with examples ad verbatim are presented in Table 4.3.

Table 4.2 Overall categories arising from content analysis of open text box feedback throughout the survey.

Category	Corresponding analysis location
Positive feedback	**Figure 4.2**
HR Measures	**Table 5.2**
Survey Layout	**Table 5.2**
Wellbeing	**Table 5.2**

Table 4.1 Demographic information of preliminary survey respondents (n=32)

Age range	**18-24 n=4** **25-34 n=7** **35-44 n=5** **45-54 n=5** **55-64 n=11**
Gender	Female n=25 Male n=7
Employment	Full time N=18 Part time=4 Postgraduate student =7 Other = 3

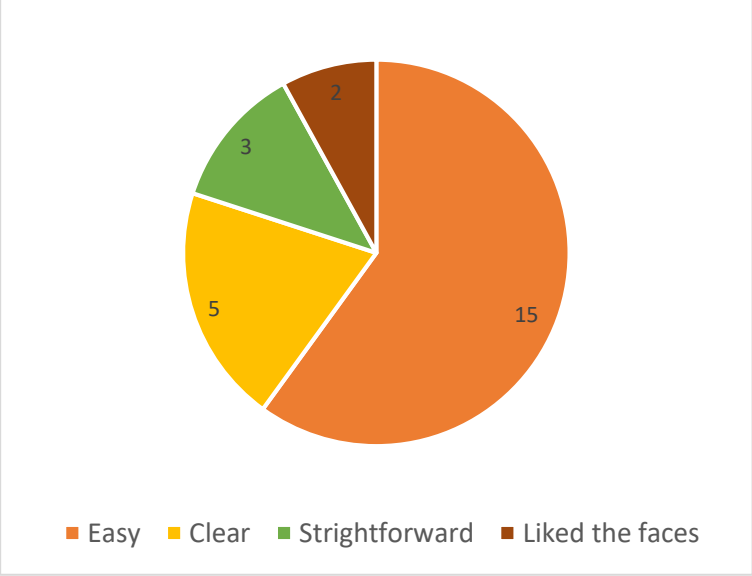


Figure 4.2. *A pie chart showing frequency of codes, categorised as positive feedback.*

Table 4.3. Content analysis with the frequency of categorised codes from open textbox feedback throughout the survey.

Category	code	Code description	Frequency	Quotes, directly transcribed
Heart rate (HR) Measures	Difficulties with physiological measurements	Feedback on participants' struggles with the Physiological measures section, describing it as time consuming and fiddly	2	• The heart rate monitor is a bit time-consuming. • I didn't use the hr app. Too fiddly to download.
	Suggestions for physiological measures	Feedback suggesting ways of measuring HR.	2	• Compare everyone before and after exercise • An option to note how long after the exercise the heart rate has been measured (approx.) may be useful.
Survey layout and presentation	The potential value of radio buttons	Feedback suggesting radio buttons would be preferable to tick boxes.	3	• It is possible to use radio buttons instead of tick boxes for this type of questions • It would be better to use radio buttons than check-boxes • Radio-buttons preferable, but pop-up prompt works ok
	Smiley faces can have latent messages	Feedback was given on the faces, querying whether unhappy faces correlate with bad due to the red colour.	1	• Whilst the faces make it easy to understand, some concern that with the colour coding they could denote 'good' and 'bad' which could make people feel uncomfortable with reporting 1s and 2s.
	Challenges with completing scales	The feedback was that the 10-point scale of the ONS wellbeing scale was more difficult than the WEMWBS 5-point scale.	1	• A little tricky to complete with such a broad range of options. Could probably have estimated with 5 rather than 10
Wellbeing	Fluctuations in wellbeing can affect responses	Feedback suggests that fluctuations in wellbeing can be due to a variety of stressful circumstances.	5	• Period during lockdown, I am not sure how much this reflects my general wellbeing • Lots of tricky situations in my life atm on top of Covid! • I have just gone through a traumatic experience, so this is not necessarily representative of a normal week for me • Particular circumstances yesterday were work related which reduced happiness/induced anxiety • I'm not sure how much people's view would vary when looking at the past two weeks' vs in general.

4.3.3 Feedback directed questions

As described in section 4.2.5, the final page of the survey asked participants to state their level of agreement with five statements and elaborate with a free text box. Responses to these questions are shown graphically in figures 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, while the qualitative open text box elaboration were coded by content analysis and shown in tables 4.4, 4.5, 4.6, 4.7. The final page open text box data for participants to provide feedback on the overall survey, is displayed in figure 4.9.

Feedback on Question 1: 'I found this survey easy to use'

Regarding ease of use: all but 3 respondents agreed the survey was easy to use (Figure 4.3), those 3 were neutral in opinion, total n=32 responses. 11 responses elaborated qualitatively and the data is shown below in Table 4.4 with example quotes.

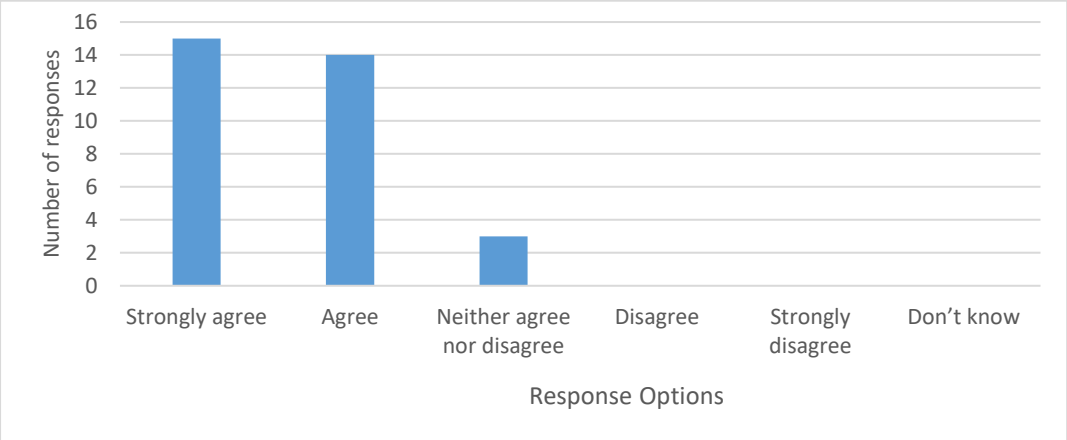


Figure 4.3. Bar graph showing responses to feedback Question 1: 'I found this survey easy to use'

Table 4.4. Open text box feedback after Q1: 'I found this survey easy to use', coded and categorised with a content analysis from n=13 responses.

Category	Code	Code description	Frequency	Example quotes ad verbatim
Positive feedback	General Positive feedback	Participants gave general positive feedback and found the survey took less time than expected)	2	• Max of 10 minutes • Great
	Clear	Participants found the instructions and wording to be clear	4	• Questions are clear and unambiguous. • Clear instructions • The instructions and questions were always very clear. • Survey wording was clear and intuitive.
	Easy and simple	The participants found the survey to be easy and simple	2	• The questions were easy to answer • Simple to complete answers
	Survey layout	Participants liked the survey's layout	2	• Well laid out • Good layout
HR	Heart rate Monitoring difficult	Participant did not favour the HR monitor and found it took time to complete, download.	3	• Heart rate monitor is too time consuming. • Easy to use but downloading the timer app took a bit longer. • Only hr measurement was irksome. Not sure why it's needed

Feedback on Question 2: 'This survey would be easier to use if it was in the form of a mobile app'

Regarding ease of use in a mobile format, the majority of responses were indifferent with at least n=14 disagreeing with the question, n=6 liked the idea and n=10 were neutral about it as seen in Figure 4.4 total n=32 responses. The content analysis shown in Table 4.5. elaborates on how people would prefer to not add apps to their phone.

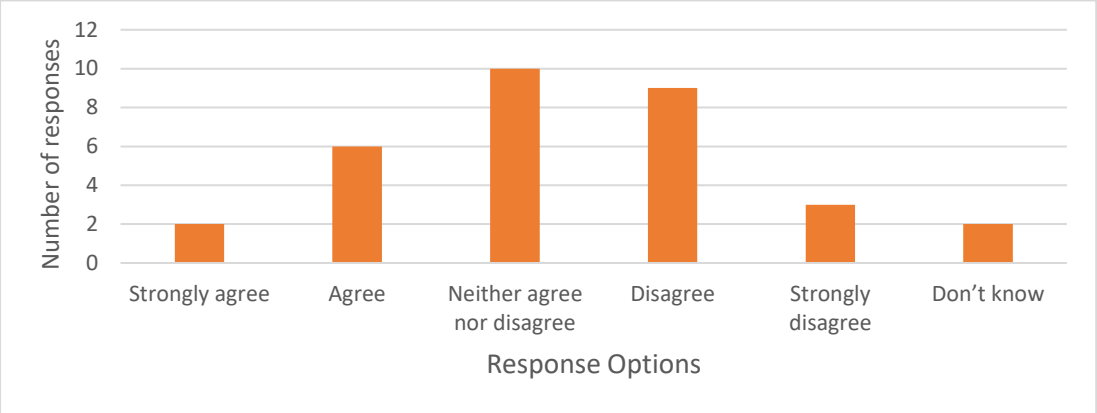


Figure 4.4. Bar graph showing responses to feedback Question 2: 'This survey would be easier to use if it was in the form of a mobile app'

Table 4.5. Open text box feedback after Q2: 'This survey would be easier if it was in the form of a mobile app', coded and categories with content analysis from n=15 responses.

Category	Code	Code description	Frequency	Quotes, directly transcribed
Agree	Would encourage usability	Feedback suggested it would encourage functionality and convenience	3	• May also drive greater participation • Greater convenience, with one question at a time. • It would be good if the heart rate function could be built in, rather than opening another app and copying across the data.
Disagree	Personal preference to not use an app	Feedback suggesting participants would prefer to complete a desktop survey.	6	• I find mobile apps harder to use. • rarely use my phone for such things • Personal preference I guess, I am happy with completing on tablet and easier for my eyes • I don't have a usable smartphone. • I used a desktop as I'm at work • I think this survey is perfectly accessible as it is.
	Don't want to download an app	Feedback suggests participants don't want to use an app because of problems downloading.	3	• App would require a download which wouldn't be ideal • Not sure but don't want to clog my phone with extra apps • don't want the cookies
	The format would prove difficult on an app	The current format would not be or was not easy to use on a mobile app.	3	• I just happened to do this on my phone and some of the tables looked a bit strange • The scales were a bit awkward to see in the current format • I doubt if all the info would fit within the screen and you'd probably have to keep scrolling up and down. It would be annoying

Feedback Question 3: 'I am not interested in Green spaces or the outdoors'

The majority of (n=31) responses disagreed with this statement as seen in figure 4.5 total n=32 responses.

A content analysis on the open text feedback in figure 4.6 was attempted on the free text box data n=12 responses in total. One response was removed as it did not relate to the current question posed. However, the n=11 context responses were all in favour of green spaces and as such the data is presented here as a bubble graph, figure 4.6 instead of a content analysis as a more appropriate data display.

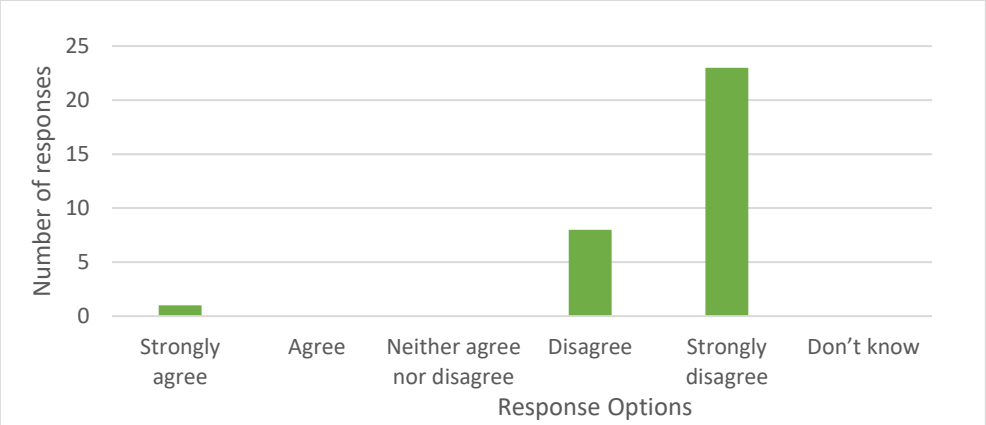


Figure 4.5. Bar graph showing responses to feedback Question 3: 'I am not interested in Green spaces or the outdoors'

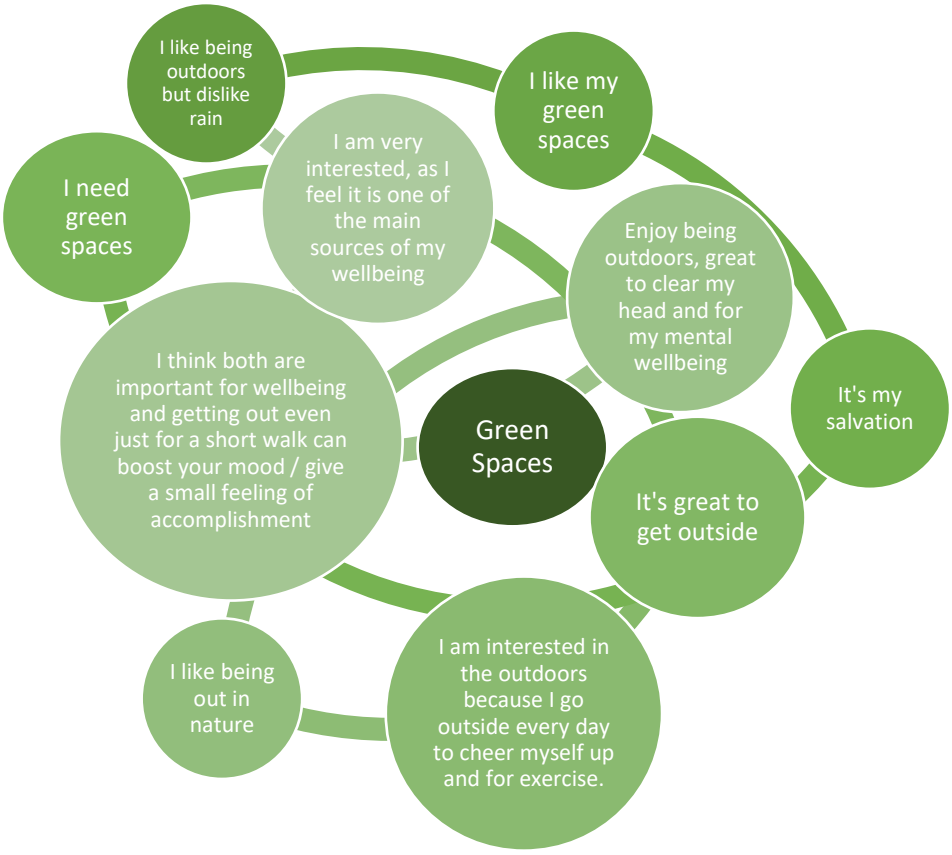


Figure 4.6. A bubble graph showing open text box feedback responses to Question 3

Feedback Question 4: 'I would be happy to complete this survey before and after spending time outside'

As shown in figure 4.7 the majority of participants (n=24) agreed or strongly agreed with Question 4, total n=32 responses. N=6 subjects neither agreed or disagreed and n=2 subjects disagreed. A content analysis on participants open text box feedback, (n=6 responses), provides explanations as to why participants disagree and agree with this statement, as seen in Table 4.6.

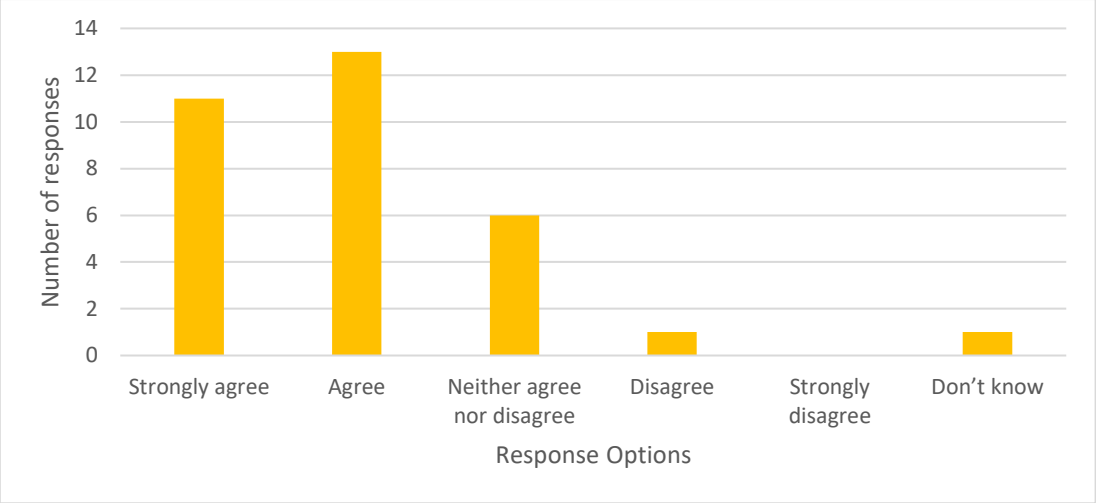


Figure 4.7. A Bar graph showing responses to feedback Question 4. 'I would be happy to complete this survey before and after spending time outside'

Table 4.6. Content analysis of open text box feedback after Q4: 'I would be happy to complete this survey before and after spending time outside' n=6 responses'

Category	Code	Code Description	Frequency	Quotes, directly transcribed
Disagree	Motivation	Participants suggested it would be difficult to measure wellbeing in this way without an incentive	1	• Not of my own volition. Maybe with some sort of incentive.
	Screen time	Participants suggested that they would not like to look at a screen before or after spending time outside.	1	• last thing I want to do before I go out is delaying to complete something on a screen. Similarly, straight after I come back I am too relaxed to switch on a device.
Agree	Remembering	Participants would be happy to complete this survey especially if they remembered	2	• I kept forgetting when I went outside, but if I remembered would be happy to do both • I go outside every day and it would be fine for me to complete the survey before and after being in a green space.
	Measuring wellbeing	Participants feedback that it would be interesting to measure wellbeing for themselves and others	2	• I believe recognising and seeking to understand people's experience of nature is more important than ever - such a study would be very worthwhile doing • Interesting to see the difference in my mood before and after.

Feedback Question 5: 'I would find it difficult to complete this survey both before and after spending time outside'

The majority of participants disagreed (n=10) or strongly disagreed (n=8) with this question however (n=5) participants agreed and n=3 did not know as seen in figure 4.8 total n=31 responses. Participants open text box feedback provides explanations as to why participants disagree and agree with this statement, as seen in Table 5.5.

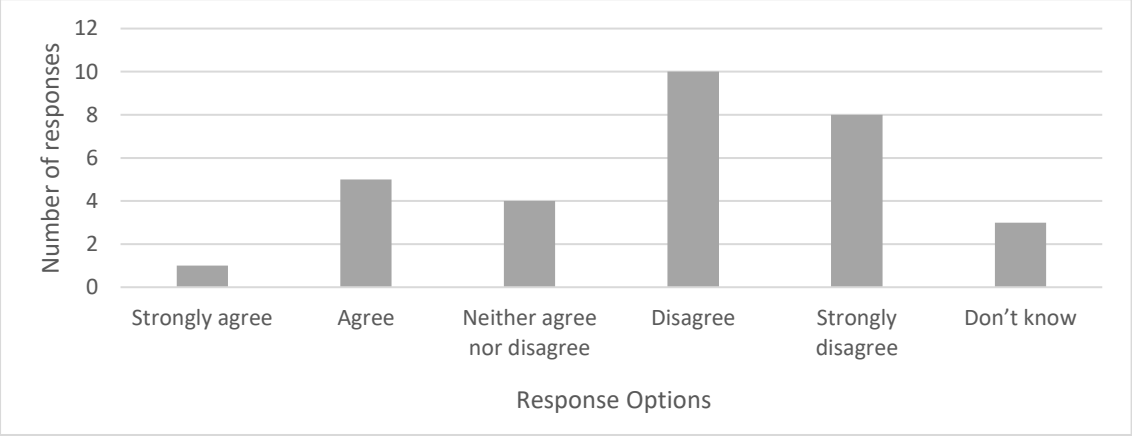


Figure 4.8. A Bar graph showing responses to feedback Question 5 I would find it difficult to complete this survey both before and after spending time outside'

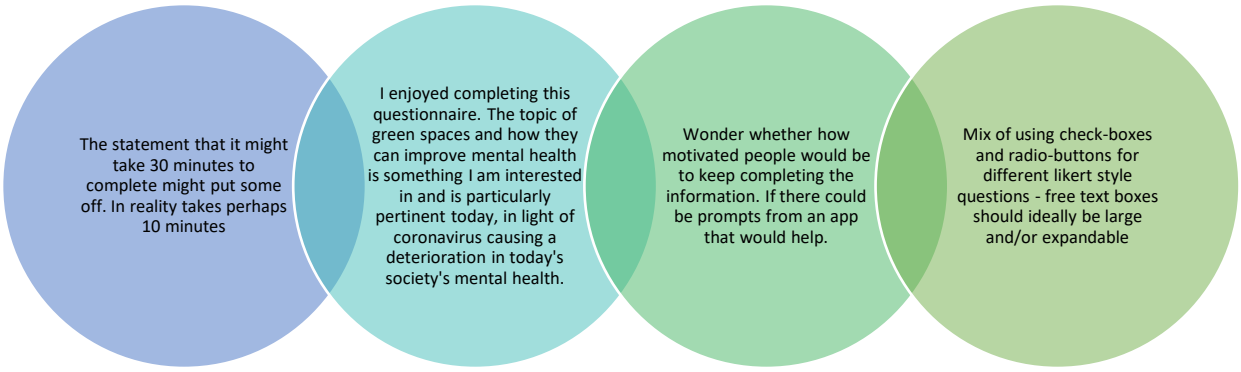
Table 4.7. Content analysis of open text box feedback after Q5: 'I would find it difficult to complete this survey both before and after spending time outside', n=10 responses

Category	Code	Code description	Frequency	Quotes, directly transcribed
Agree	Limited time	Participants responded that time constraints meant that they wouldn't be able to complete the survey before and after spending time in green spaces.	5	• It feels like I have less spare time to do things. • If this was done in an environment where your breaks are timed it might take-away from the time spent outside, or completing other things during a break. Sometimes you may not intentionally go into green space, e.g. walking between meeting, so you may be able to complete after but not before. • It is time consuming to complete the questions before and after/ also it is very repetitive and not engaging. • time constraints • I don't think I would be able to schedule it in.
	Would impact experience	A participant commented on how their experience outdoors would be impacted by filling out the survey	1	• I also think my experience outdoors would be impacted by the idea that I will be completing a survey about it
	Green space access	Filling out the survey would be difficult due to the lack of local green space	1	• Hard for me to get to green spaces.
	Forgetful	Participants would have to remember to fill out the survey	1	• Forgetful as above
Disagree	App	Using an app would allow participants to take the survey with them	1	• Would likely be easier using a mobile app as the respondent would more likely have it with them before and after their time outside.
	Easy to do	A participant confirmed it wouldn't be difficult to complete this before and after spending time outside.	1	• It wouldn't be difficult

Final feedback open text box

Participants were invited to provide some feedback on their thoughts about this survey as a whole. The final feedback comments n=4 can be seen in figure 4.9.

Figure 4.9. Feedback given in the final open text box.



4.4 Discussion

This phase 2 pilot study aimed to evaluate tool iteration 2. A cross-sectional study design collected quantitative and qualitative data on participants experience of using the tool, its face validity and appropriateness. Through the use of content analyses, the study results indicate that the majority of survey respondents gave positive feedback about the survey, however, the results also suggest some participants found aspects of the survey challenging.

Smiley Face Likert scales

Key findings regarding the survey layout bring points for discussion. Regarding the smiley faces results a respondent suggested that the colours of the smiley faces going from red to green could infer that having a 'red' feeling would be bad, and therefore would be less likely to select this choice. The previously discussed (section 3.4) paper by Toepoel et al. (2019) investigates the use of a smiley face pictorial response that is coloured with the same colours as the smiley faces in the present study and noted that red can represent bad and green can represent good. However, this study does not measure the effects the colour has on response as it was not measured against a black and white

smiley face and therefore it is not known if the colour of smiley faces does affect survey responses. Tourangeau et al. (2007) investigated the effects of utilising colour to show scales with radio buttons found that respondents were hesitant to select a negative answer when coloured with red. This effect implies a limitation in the present tool design, as participants could be discouraged from one particular response. However, this effect was only seen when the scale was only labelled at each polar end, not throughout like the scale in this present study. Tourangeau et al. (2007) discuss how the colour is eye-catching therefore more likely to have a significant effect on the improved interpretation of questions. Suggesting a scale combined with colour and/or smiley faces could encourage responses from participants. However, a key point here is that the questions for both studies by Toepoel et al. (2019) and Tourangeau et al. (2007) utilised questions relating to options and attitudes whereas in this present study, the questions the smiley faces were used for related to subjective wellbeing. Therefore the appropriateness of using the faces to represent scales of wellbeing needs to be considered. McDowell (2006, p. 578) describes how the faces scale has been used as a health indicator adapted to represent levels of pain and it could be argued that the faces scale could be adapted as a health indicator to represent levels of subjective wellbeing. Another suggestion is that faces scales may be more appropriate for populations with low literacy skills. For example, using a smiley face scale matched with wellbeing measures of participants such as young children would allow interpretation and understanding of questions to a wider population. However, interpretations of images such as smiley faces must be considered as meaning may vary across cultures (Kawakami et al., 2020; Toepoel et al., 2019) and therefore may not be generalizable. From this discussion, recommendations for future studies include utilising the smiley faces to represent levels of wellbeing if considered appropriate for the cultural population and question type. However, further research is needed to investigate the use of multi-coloured compared to greyscale smiley faces as response categories for measures of wellbeing.

Response Indicators

Another finding from the data was the suggestion of the use of radio buttons instead of tick boxes. Toepoel et al. (2019) define: “Radio buttons are circles in which a respondent clicks to provide an answer”. In the present study, radio buttons were not used as the development of the WEMWBS suggests using tick boxes as a response (Tennant et al., 2007). After investigation, it was found that radio buttons could be more appropriate as a response option, as Wang (2017, pp. 415-436) described, radio buttons are used when the responder has the option of not selecting anything or selecting one option, whereas tick boxes are used when many options can be selected. In this present study for the measures of wellbeing, participants may only select one option on the Likert scale as their defined measure of wellbeing. Therefore, it is concurrent that radio boxes could have been used instead of

tick boxes. It is unknown how this may have impacted responses in the study and presents a study limitation that this response option was not investigated before completing the final iteration.

Although not entirely relevant for this present study, as a point of interest for developing the wellbeing tool in the form of a mobile app, Antoun et al. (2020) found that radio buttons and tick boxes were not an efficient use of space and were difficult to press on a mobile handheld device by participants aged 60+. This finding suggests if the tool is to be developed into a mobile app, the buttons should be accessible for all ages. Recommendations for a future study suggest that whenever a participant needs to only provide one response, such as using the wellbeing Likert or slider scales then a radio button response option is used and if used on a mobile device, the buttons be large to ensure accuracy of data.

Likert Scale

Another issue with the Likert scale used was the difficulty of the scale not directly matching the number of smiley faces in the results box. Whilst the WEMWBS which uses a 5-Point Likert scale that fits well with the smiley faces the ONS4 11-point scale does not fit with a 5 image smiley based face approach. The results from the 1st iteration study were inconclusive about the ease of use of an 11-point scale, some participants suggesting that people may struggle with the scale not directly matching the number of smiley faces. The results from this present study confirmed that some subjects did find the scale difficult but an 11-point smiley point scale would be potentially confusing too. One survey respondent reported that they struggled to complete an 11-point scale and would have preferred a 5-item scale. As previously discussed, this is concurrent with research by Garratt et al. (2011) who found respondents prefer 5-item scales compared to 10-item scales. In the development of the ONS4 personal wellbeing scale, (Tinkler & Hicks, 2011) ONS4 decided to utilise the 11-point scale to aid comparisons with other surveys of interest that used similar sized scales. However, the finding that some participants struggle with an 11-point scale suggests that the ONS4 is a more challenging measure, compared to the WEMWBS. Recommendations for the tool may suggest utilising the WEMWBS or WEMWBS as the primary measure of subjective wellbeing.

WEMWBS Assessment Measures

A significant methodological limitation in using the WEMWBS for this current study argues against its sole use as the wellbeing measure. The WEMWBS (Tennant et al., 2007) was developed to be used in both cross-sectional and longitudinal designs, however, as the measure requires participants to reflect on the past 2 weeks to answer, it is implied that wellbeing measures should be taken 2 weeks apart. The present study utilised the WEMWBS before and after spending time in green spaces, the time between measurements was not defined and could be as little as 5 minutes. This poses a significant

limitation in the data as the WEMWBS may not be sensitive enough to pick up measurements so close together. Research using the WEMWBS pre-and post-intervention usually take measurements of wellbeing at least four weeks apart (Sumner et al., 2021; Zollars et al., 2019). Maheswaran et al. (2012) investigated the responsiveness of the WEMWBS at the individual and group level but only found it to be sensitive to changes when measures were taken pre and post interventions lasting from 4 -12 weeks. This finding could be due to the effectiveness of the intervention but could also imply that the WEMWBS is not sensitive enough to evaluate change in wellbeing from any period shorter than 1 week. However, further research into the sensitivity of the WEMWBS and WEMWBS is needed as noted in studies by (Fat et al., 2017).

Therefore, we cannot assume whether the WEMWBS is sensitive enough to detect rapid changes in wellbeing in the present study. This discussion leads to recommendations for future studies, if the goal of the tool usage was achieved and it was used to measure wellbeing with time points at least a week apart then it would be considered appropriate as this data could be collected and evaluated longitudinally.

Timescale

This issue of time scale is also prevalent when using the ONS4 personal wellbeing scale. As discussed in a summary report by the Office of National Statistics (2013) the time reference points in questions can lead to variable responses. For example, using time reference periods such as 'nowadays' and 'these days' leads to variable responses as there is a limited definition of the timescale within which to answer. However, using a defined time period such as 'yesterday' also lead to difficulties in answering the question. They suggest instead providing more detailed time scale such as "'Please think about yesterday even if it was not a typical day" (Office of National Statistics, 2013). In the development of ONS4 Tinkler and Hicks (2011) describe how 'yesterday' was chosen as the specific timescale as it was approximate to the Day Reconstruction Method (DRM). Diener and Tay (2014) define the DRM as a "method of measuring subjective wellbeing (SWB) based on individual's assessment of their moods during major activities of the day" This method is considered more accessible than the Experience Sampling Method (ESM) within which:

"Subjects wear beepers, and throughout the day, at irregular intervals, the beepers go off. The subjects have to then record what they are doing and with whom, and what they felt or experienced at the time, given a list of possibilities" (Kahneman et al., 2004).

However, Diener and Tay (2014) describe how it is uncertain to what extent the DRM method decreases participant burden compared to ESM measures that use a mobile phone. They also note that it is unknown how much DRM is affected by recall bias as participants are not filling in the survey

contemporaneously. An argument can therefore be made for using ESM measures wherein the ONS4 should amend the 'yesterday' timescale to 'today' or 'Right now' so that the measure would be unaffected by recall bias. This amendment would have the same ONS4 scale but would replace 'yesterday' with 'today' and a precedent has already been set by Benson et al. (2019) who adapted the ONS4 for their studies. Benson et al. (2019) developed the Personal Wellbeing Score (PWS) which was an adaptation of the ONS4 Questions and validated these new scales in studies evaluating social prescribing interventions. Using the ONS4 questions for research is described by Tinkler (2015):

"ONS promotes the use of the four ONS subjective well-being questions for use on surveys outside the ONS within other government departments, local government, charities and the private sector".

Therefore, if possible to adapt the ONS4 scale with a specific time frame referencing the present, the recommendations for this tool would be to adapt the current ONS4 survey to measure affect within the timescale of the present. This development and validation of a revised ONS4 scale should be included in the present tool and piloted in future studies. This development of the tool measuring wellbeing modelled after ESM would allow assessment before and after spending time outside in green space and the collection of longitudinal measures of wellbeing from the WEMWBS and revised ONS4.

External Factors- COVID-19 Pandemic

A limitation of this present research is that it took place during the time of the COVID-19 global pandemic with associated travel and social restrictions WEMB (GOV.WALES, 2020b). As a result, participants access to green spaces may have been limited due to travel restrictions and park closure (Slater et al., 2020). This may have had an impact on participants willingness to take part in the study, although the study did not specifically require participants to go outside, the advertisement (Appendix K) may have implied access to green space to be necessary. In future research, a question investigating local access to green space is recommended as this would help to inform the researcher of any access limitations for participants.

This time of significant change has had effects on mental health and general wellbeing (O'Connor et al., 2021) and is reflected in the feedback form where respondents discussed how unexpected fluctuations in their wellbeing were occurring. It is possible that this would account for different wellbeing measures compared to a 'typical day' but the finding is unknown as this study did not seek to collect COVID -19 related wellbeing measurements for analysis. However, wellbeing in an atypical environment is an important consideration with any research study investigating wellbeing, especially during the COVID -19 Pandemic.

HR Measure

Another key finding concurrent to that in the previous study is the usability of the HR measure. Feedback indicated that using the HR app was challenging, being described as 'time-consuming' and 'fiddly'. The aim of using the app Instant Heart Rate® was that measuring HR would be simple and easy for participants. However, the current findings seem to demonstrate this is not the case and that the inclusion of the app added difficulty to tool completion. Another finding suggested the researcher compare HR measures before and after exercise and not how long after exercise the HR has been measured. These findings support the point that in order to collect an accurate measure of HR, studies must be tightly controlled to eliminate extraneous variables as seen in the study by Park et al. (2010) previously mentioned (sections 2.2.2 and 3.4). The extraneous variables in the current study could not be controlled as respondents completed the HR measure in a natural setting, in their own time, with clear instruction, but with no researcher to reliably check HR was measured accurately. Further research into the variables that affect the heart suggests that HR is affected by age, sex and athletic conditioning of participants Makivić et al. (2013) discusses how all these important variables influence the autonomic control of the heart and should be considered when measuring physiological heart changes. This suggests that inferring stress levels from HR can be complicated and inaccurate. Although associations between green space exposure and lowering HR are statistically significant (Twohig-Bennett & Jones, 2018), in this present pilot study measuring HR proved to be challenging and if used in the tool in a larger scale study could lead to reduced subject participation and inaccurate data. Therefore, it is recommended for this current tool design, the HR monitor is be removed as a measure of wellbeing whilst the questions relating to physical exercise and time spent in green space remain valuable data. Further work investigating the role of green spaces on HR is needed to support this as a measure of wellbeing.

Usability and Function-App

Another key finding relates to the usability and function of tool iteration 2. Both qualitative and quantitative participant feedback reported positively on the survey layout. Most respondents reported that the study was easy (n=15 open text boxes, n=15 strongly agree, n=14 agree from the bar graph, n=2 content analysis of feedback question 1). This finding along with responses that the survey was clear (n=5 responses from the open text boxes and n=4 from content analysis of feedback question 1). These findings demonstrate that despite challenges with the tool sections and usability the overall design was fit for purpose. These positive results around how the survey was delivered also related to participants options of how the tool should be implemented. Participants' feedback on the possibility of the survey being delivered on an app suggested mixed preferences. When participants were asked if the survey would be easier to complete as a mobile app, many disagreed (n=9 responses

from the bar graph and n=12 from the content analysis for feedback question 2). The feedback indicated this was due to personal preference, not wanting to download an app on their phones and (the current format was not accessible on a phone as the 11 point scales were too long). Given that JISC online surveys experienced formatting issues with this tool when accessed via mobile devices, this result is not unexpected. If the survey was hosted on a site that was more suited to mobile survey collection, for example, Qualtrics, this feedback might have been different although there may be financial implications for the researcher to allow access to the app.

However, some responses agreed using a mobile would be easier (n=6 responses from the bar graph and n=3 from the content analysis for feedback question 2), stating that it may drive greater participation with increased convenience. Indeed Wells et al. (2014) found answering open text box questions easier on mobile apps compared to an online computer, due to the difference in size box available to participants. This benefit supports the use of smartphone surveys as it would increase motivation for completion and response rates. Antoun et al. (2017) also found smartphone users to type longer answers into open text boxes and that response quality did not differ even though mobile survey users report being around other people and multitasking more than PC survey users. However they found some participants on mobile phones had trouble with small-sized scales, this concurs with the study by Antoun et al. (2020) who found that small scale radio buttons made survey completion difficult. Recommendations for this tool in a future large-scale study would be to convert the survey to a platform that is accessible for both mobile apps (with consideration for small scales) and PC's so that the survey is accessible to the user preference.

Potential Selection Bias

The last key finding of this study suggests a strong prevalence of bias towards green spaces as an area of personal interest to the participants of this study. This result is seen in Question 3 'I am not interested in green spaces or the outdoors', which found that the overwhelming majority of respondents disagreed with the statement (n=23 strongly disagree n=8 disagree on the bar chart for feedback question 3). The bubble graph (figure 4.6) elaborates on the findings from the bar graph detailing how n=11 responders, liked green spaces, considered them important and have a personal interest in nature. As discussed in section 3.4, utilising a convenience sample (Johnson, 2014) could have resulted in responder bias (Hazel et al., 2016) and as this is a small sample size n=32 the responder bias is more likely to affect the findings. These findings are consistent with research by Richardson et al. (2016) noting that personal interest and a greater connection with nature can encourage greater motivation to take part in research around the topic of green spaces. This suggests a limitation as the population studied could be biased towards an interest in green spaces and utilising nature for wellbeing.

In the tool iterations 1 and 2 pilot studies, this bias is not an issue as their aim was to collect feedback on the tool. However, in future research, it is recommended to measure the effects on wellbeing with either a control group parallel to a green space 'test' group or to add a question such as 'I have a personal interest in green spaces and nature' to determine if this bias is prevalent in a larger population sample.

Study Design

Final methodological limitations of the study include the use of cross-sectional analysis, due to research end of project limitations when the tool was designed to be eventually used longitudinally. This is an obvious limitation as although data collected allowed for evaluation of the survey layout and ease of use, the tool was not utilised as it was designed to be. In this present cross-sectional survey participants responded it was easy to use however this result cannot be generalised as they did not utilise the study in a longitudinal design. Recommendations for the future use of this tool include piloting the tool in a larger sample size longitudinal study before general use.

In conclusion, this cross-sectional phase 2 pilot study examined the second tool iteration. Feedback from participants and discussions of study limitations and strengths has suggested implications for changes to be made to the tool as seen below in section 4.4.2. Recommendations for further work include; investigation into red to green vs greyscale colour coloured smiley faces; extended investigation into green spaces and the effects on HR measures; utilising a control group when measuring the longitudinal effects of green spaces on subjective wellbeing and this discussion recommends considering the impact of the COVID -19 pandemic and its impact on wellbeing on these measures of subjective wellbeing.

4.5 Final tool iteration

The recommended changes to the tool design informed by the results from this study were:

5. A revised ONS4 should be included in the tool, piloted and validated in future studies. This would create an appropriate measure of wellbeing for before and after spending time outside, the WEMWBS would still be included as a validated tool to measure wellbeing longitudinally.
6. Remove the Heart Rate monitoring as a measure of physiological stress from the survey.
7. Include questions regarding local access to green space and participants personal interest in green spaces.
8. Replace the tick boxes with radio buttons when only one response option is required.
9. Host the survey on a web app that is accessible on a PC and a mobile.
10. Finally pilot the survey with further specific study populations to check appropriate demographics.

4.6 Conclusions

This wellbeing tool has been evaluated and through an iterative process based on the feedback from participants on using this tool to assess subjective wellbeing before and after spending time in a green space. The results from this 2 phase pilot study have led to recommendations on the final tool's design. This final tool design could be appropriately used to support much larger investigations into the association between green spaces and subjective wellbeing.

Chapter 5 Development of Green space at Ysbyty Ystrad Fawr

5.1 Project aims

This current research aimed to:

To create a green space at an NHS hospital site from which staff, patients and visitors can benefit.

a. Work with hospital staff to curate ideas for the garden
b. Engage hospital staff to create the garden
c. Collect feedback from staff on garden use and impact on wellbeing once created

The aims of this project are in line with the aspiration of the well-being of the Future Generations (Wales) Act (2015) (Future Generations Commissioner for Wales, 2021). The role of Public service bodies such as the NHS is to improve wellbeing through sustainable development goals (GOV.WALES, 2016) and this present research aims to support a more 'Prosperous Wales' by increasing biodiversity and a 'Healthier Wales' by providing a space to improve health and wellbeing.

The original research plan was to grow an area for wildflowers and wellbeing in an area of managed lawn within the grounds of the Ysbyty Ystrad Fawr (YYF) hospital site. This would create an open-access green space that would support local biodiversity and would allow space for staff and visitors to access a nature-rich space to enhance their wellbeing. This green space would also provide the researcher with an environment in which to assess the subjective wellbeing of NHS staff with regard to spending time in this particular green space. However, as previously outlined, the evolving COVID-19 pandemic prevented the participation of NHS staff in the research and limited interaction with site personnel to develop this green space project. Despite this set back a nature-rich green space was developed, albeit on a much-reduced scale and feedback on attitudes towards the green space were able to be collected via online social media. A final end of project interview with NHS staff involved in this project's development collected feedback about staff usage of the green space and discusses future directions and legacy of the project. As such this chapter is organised into four sections as seen in Figure 5.1.

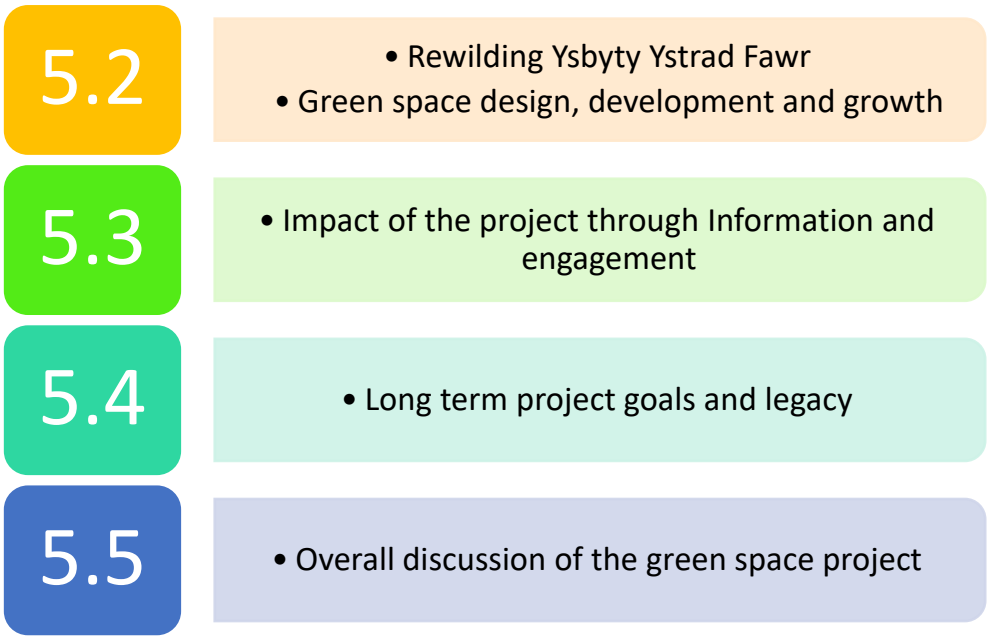


Figure 5.1 A summary of Chapter 6 sections

5.2. Rewilding Ysbyty Ystrad Fawr project

The advantages of a Hospital having a garden as previously discussed in section 1.3.2 include benefits for patients staff and visitors. Hospital gardens are said to lead to reductions in stress, pain and pain medication doses, depression, reduced costs due to reduced length of stay; increased mobility, independence of movement, patient satisfaction and job satisfaction for staff (Marcus, 2007). The restorative effects of green spaces support these health benefits and indicate that they are a valuable resource and tool for improving wellbeing (Hartig et al., 1991).

NHS Hospitals all over the UK have developed wellbeing gardens, as an integrated part of treatments and care to increase patient wellbeing. For example, within Wales, the Aneurin Bevan University Health Board developed community gardens at Llanfrechfa Grange hospital (Aneurin Bevan University Health Board, 2020b) and at the Hywel Dda centre Mental Health clinic (Aneurin Bevan University Health Board, 2020a). The centre for Sustainable Healthcare has a project called NHS Forest (2020) which aims to inspire healthcare professionals to use green spaces through a number of programmes aimed to improve the wellbeing of both staff and patients.

5.2.1. Site Layout and planned rewilding areas

The research site for this project was Ysbyty Ystrad Fawr (YYF), an Aneurin Bevan University Health Board NHS site in Ystrad Mynach, Caerphilly. The Hospital is surrounded by a uniform row of trees and strips of regularly mown grass (see figures 5.2 and 5.3). The land around the YYF building has potential for development and includes a single path that can be followed around the entire hospital. In October 2019 this land was managed by cutting the lawn and shaping the trees. Working collaboratively with NHS staff members from the hospital's management team a plan was developed to halt grass cutting and rewild the site by letting the grass grow and planting wildflower seeds to promote biodiversity. Discussions around the history of the site revealed that as the land was previously a house and gardens before the hospital's development (see Appendix M) the soil may contain more diverse plants than just turf grass. The green space project team debated whether the grass, if simply left to grow, would produce native wildflowers or whether the soil beneath the turf was barren of native wildflower seeds. There were also concerns that as there were no previous trials and the land had been dug up during site construction in 2012 it was possible that no wildflowers would grow. However, natural pollination of wildflower seeds would have helped the natural ecosystem to be restored slowly over time (Corlett, 2016). As the development of this green space was to benefit staff wellbeing and due to COVID-19 restrictions, the research team were unable to access the area for development. It was decided that staff co-designing this project would sow the land with wildflowers seeds whenever they could to make up for the assumed lack of variety. By planting wildflowers, the aim was to ensure that at least some wildflowers would grow in the summer in partnership with the rewilding intervention, through which the land would be left to wild and the project team would simply observe what plants grew..

The area proposed to rewild consisted of a bank running alongside a car park and a larger area of land by the hospitals' main entrance, as shown in figure 5.2. This rewilding approach would convert the selected area into a bio-rich space that could be used by staff, patients, and visitors. Discussions with staff project partners led to an agreement that the green space would be turned into a wellbeing wildflower meadow bisected by a path with benches strategically place along is space to create areas of quiet reflection as seen in figure 5.4. This would enable green space visitors to sit amongst the flowers and enjoy the wellbeing space.

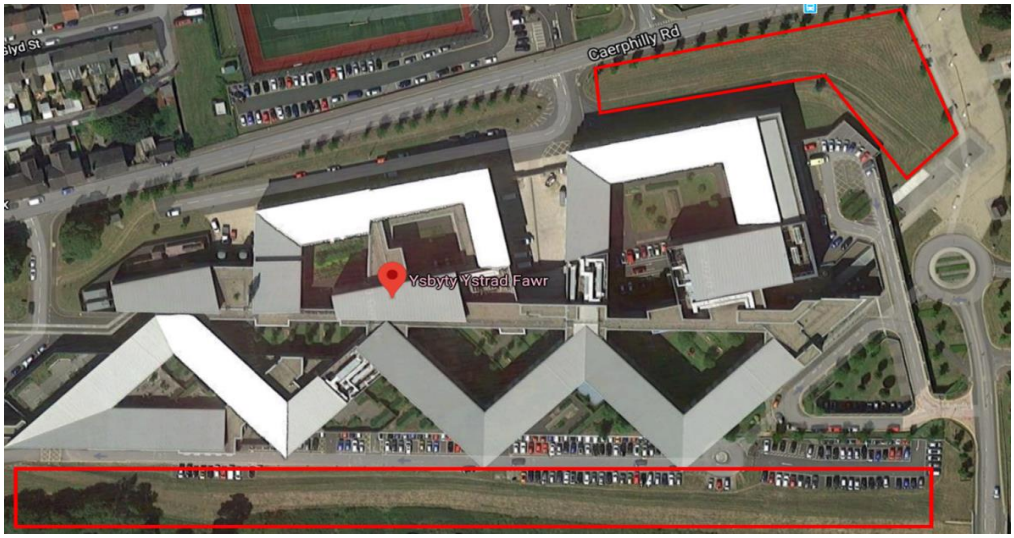


Figure 5.2 An aerial view of Ysbyty Ystrad Fawr grounds, red lines outline areas of green space accessible for rewilding, with the proposed wildflower meadow area shown top right and the bank shown along the bottom of the image (Picture accessed from Google Earth)

Figure 5.3 Green space at YYF before rewilding in October 2019

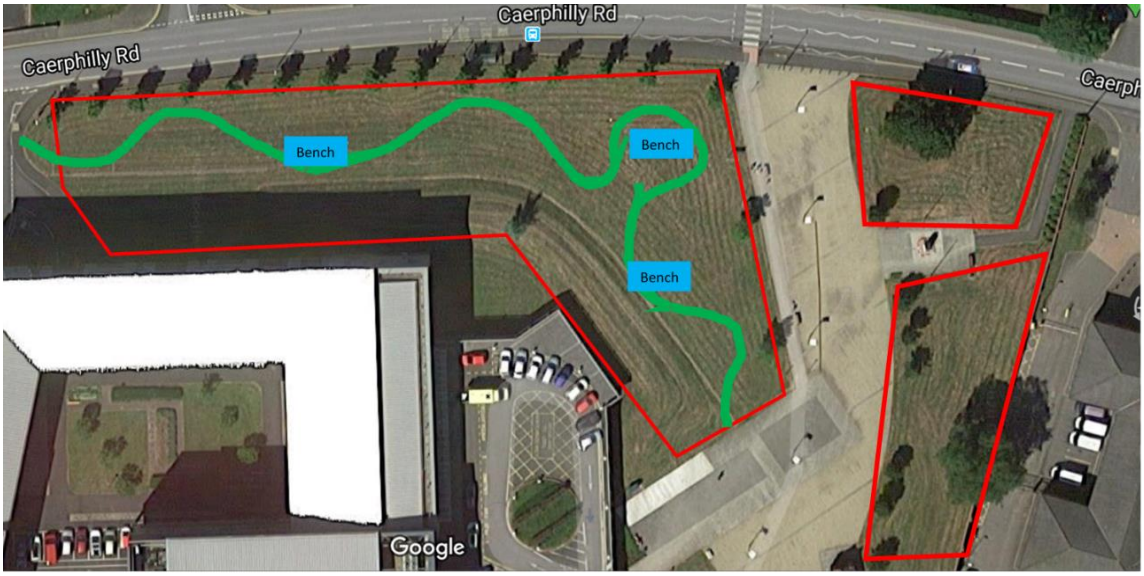


Figure 5.4 Demonstrating areas to be rewilded and placement of benches and the path, in green

5.2.2 Why rewilding?

Green spaces are beneficial for mental and physical health, as discussed in Chapter 1, and this is particularly important as hospitals can be stressful places for both staff and visitors (Newson et al., 2020). The hope was that the restorative effects of this green space (Hartig et al., 1991) would have a positive impact on both people and the ecosystem (Perino et al., 2019). Landscaping the grounds to be low maintenance also benefitted the environment. By allowing the grass to grow naturally it is hoped to be able to restore the natural flora.

Rewilding is the process of "returning a managed area back to wild" (Corlett, 2016). Perino et al. (2019) described rewilding as the restoration of complex ecosystems to a self-sustaining state with "ecological processes that promote and support one another while minimizing or gradually reducing human interventions". Rewilding ecosystems have a low human impact and are self-sustaining. This approach was employed as the benefits of rewilding the landscape would match the hopes for the project development. An implied cost-saving for lawn management was presumed although not calculated. By not mowing the lawn, only baling it once a year it was assumed that estates would reduce fuel usage and therefore reduce fuel outputs, suggesting an economical and environmental benefit.

It was also hoped that by returning the site to its natural state the biodiversity of the local area would improve. Allowing native plants to grow increases the biodiversity of plants but also supports local wildlife such as a range of insects and birds. Encouraging and allowing for native flowers to recolonise

it was hoped would also encourage bees and other natural pollinators which in turn encourages more flowers in the beneficial cycle of rewilding (Wallace, 2019).

5.2.3 Rewilding methods

The site after the last grass mowing in October 2019 can be seen in figure 5.3 from this point onwards the grass was allowed to grow wild. A native wildflower seed mix developed by Cardiff University Pharmabees was used. A list of the wildflowers in the seed mix can be found on the website for this green space project (See Appendix N). The original plan was to engage the local community and primary schools in process of distributing the wildflower seeds across the site as a way of learning about plant growth and bio-diversity. Unfortunately, the COVID-19 restrictions prevented the project from adopting this approach and as a consequence, the sowing of the seeds was undertaken by a small number of Ystrad Mynach staff members involved with the project. The project wildflower timeline is summarised in figure 5.5. The site was monitored by the NHS staff involved in the green space development and updates on the appearance of wildflowers were emailed to the researcher from April to May 2020.

A subsequent visit to the green space and collection of pictures of wildflowers was undertaken by the researcher in late July 2020.

Figure 5.5 Progression of the Rewilding Project Timeline

5.2.4 Rewilding results

The impact of the rewilding on human wellbeing and social health are discussed in 5.3 and 5.4. This current section considers the environmental impact of the projects' development.

The first wildflowers appeared in April 2020 (Figure 5.6) and continued to grow in variety in July 2020 (Figure 5.7). The plant names and flower types are labelled in these figures demonstrating the vast variety of wildflowers and grasses that grew. Comparative pictures before and after rewilding are shown in figure 5.8. As predicted the green space has converted from a monoculture of turfed lawn grass to a bio-diverse variety of wildflowers and meadow grasses. Compared to pre rewilding and pre COVID19 pandemic the NHS staff member updating the researcher noticed an increase in biodiversity of the area with sightings of birds, insects and one notable occurrence of larger species (Figure 5.9).

These findings are positive as increased biodiversity and improved ecosystems have been shown to be important for wellbeing (Taylor & Hochuli, 2015).

By not mowing the grass regularly, it can be assumed that the project led to reduced fuel emissions compared to regular lawn mowing (Lerman & Contosta, 2019), however, this was not specifically measured. Nonetheless, by restoring natural grassland an increase in carbon sequestration and nitrogen accumulation within the soil will have taken place. De Deyn et al. (2011) found that long term biodiversity restoration lead to high rates of carbon sequestration and nitrogen storage. The hospital is built on a flood plain and the green space is frequently flooded in the winter. Although this poses problems for providing year round green spaces for staff, Joyce et al. (2016) describe how wet grasslands aid with surface runoff, therefore the introduction of wildflower grasslands could aid the area in flood protection as well as improving the carbon footprint.

Flowers that appeared and were identified from left to right, Cuckoo flowers, Buttercups, Greater stitchwort and Common daisies, Oxeye daisies or Corn Chamomile, Sweet vernal-grass and Bird's foot trefoil.

Autumn hawkbit, Pink Clover, Bluebells and Corncockle and Corn chamomile

Cowslips, Cow Vetch, common daisies.

Figure 5.6 Photos of the YYF green space taken from April to May 2020

Plants Identified from left to right, Corn Chamomile, Birdsfoot trefoil and Selfheal, White clover and Musk Mallow

Oxeye Daises and Sweet vernal grass, Pink clover and Dandelions

Figure 5.7 Photos of the YYF green space in July 2020, fully developed into a wildflower grass meadow

Figure 5.8 Before rewilding (Left) In October 2019 and after rewilding (Right) in July 2020

Figure 5.9 Sheep resting and grazing in the wildflower meadow at YYF

5.3 Information and engagement

This section details how the researcher was able to interact with an online community providing information and collecting feedback on attitudes to the project.

5.3.1 Background

Due to the impact of COVID-19, access to the hospital site was extremely limited, due to the need for social distancing. This impact had benefits and drawbacks, the benefits being that spending time in outdoor green space was encouraged, so more people around the hospital would use the outdoor green space. The drawback was that engagement with the green space by the community around the hospital was limited due to lockdown restrictions.

5.3.2 Methods design

This project originally aimed to collect feedback from NHS staff on use and attitude towards the green space. However, during that time (March 2020 – September 2020 when the meadow was cut) it was increasingly difficult for the researcher to collect feedback on the green space from NHS staff and community as the hospitals were at capacity (GOV.WALES, 2020a) and lockdown measures were in place (GOV.WALES, 2020c). Therefore, it was decided that the researcher would provide information and attempt to collect data from engagement with the online community around YYF. This information and engagement were vital so that the public would be informed that the rewilding was part of an active project and not part of an estate cost-saving exercise. However a limitation of this method was that the researcher relied on correspondence with NHS staff for pictures of wildflowers and updates on the local area due to lockdown measures, this was sometimes difficult for the project as pictures of wildflowers from the site were not essential in comparison to day to day running of the hospital at full capacity.

A website (Appendix N) was designed to inform the public about the aims of the green space project. The bilingual (Welsh and English) website provided information on the positive impact that spending time in green spaces can have on mental and physical wellbeing. It also included information on the wildflower plants that grow across the site and resources which explored the environmental impact on biodiversity and carbon emissions. The website also provides links to engagement activities where people can get involved in other green initiatives. The website and social media links can be located in Appendix N.

Reaching out with social media proved to be an invaluable means of informing the online community of project progress. Social media accounts were created on Facebook, Instagram and Twitter, updating the community about the wildflowers now growing in the area. Examples of posts can be seen in

Figures 5.10, 5.11 and 5.12 (see below). This online community engagement in the development of the project aimed to collect the local audience view in a similar fashion to, and as a substitute for, word-of-mouth comments on the green space.

Data was collected in the form of responses to the publically available social media posts for an example from the YYF Facebook page. The social media posts were measured for engagement with the online community by 'likes' 'comments' and 'shares'. Facebook Insights is a tool that allows administrators of a page to monitor activities on the page. This data analysis allows administrators to review the performance of posts including, the number of people a post reached, number of engagements in 'likes', 'comments' and 'shares'. These performance metrics are exclusive to Facebook and have been vital in informing engagement online with posts (see Appendix P). Data analysis was conducted by analysing response rates of likes and post reach on the Facebook posts, calculated by Facebook page analytics.

The comments on posts were analysed by thematic analysis. A thematic analysis was chosen as this would be able to collect rich data from the comments and was carried out using the Braun and Clarke (2006) method as described in chapter 2.5.2. Ethics approval from Cardiff University Research Pharmacy Ethics Committee was granted on 19/06/20 SREC reference: 1819-25 (see Appendix O). Informed by Townsend and Wallace (2016) as these posts are publically available consent to participate did not need to be collected. This was confirmed by reading the terms and conditions of each social media platform, consulting with the Cardiff University Research Pharmacy Ethics Committee and anonymising all data, as advised.

Figure 5.10 Instagram posts from the rewilding Ysbyty Ystrad Fawr social media

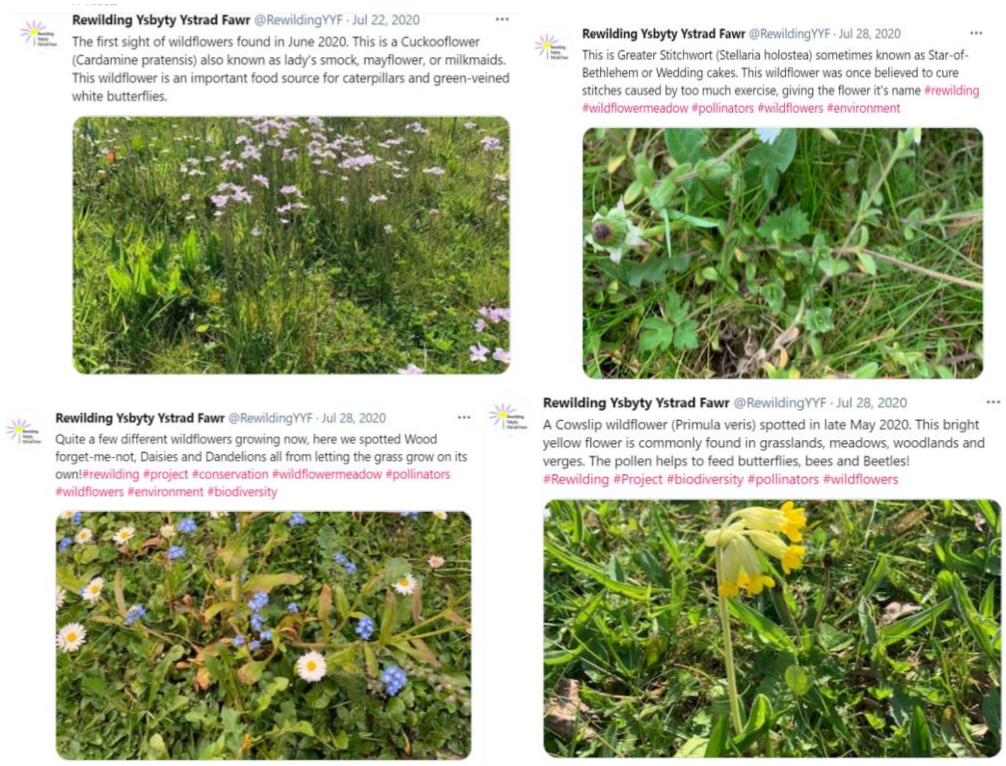


Figure 5.11 Twitter Posts from the Rewilding Ysbyty Ystrad Fawr Social media

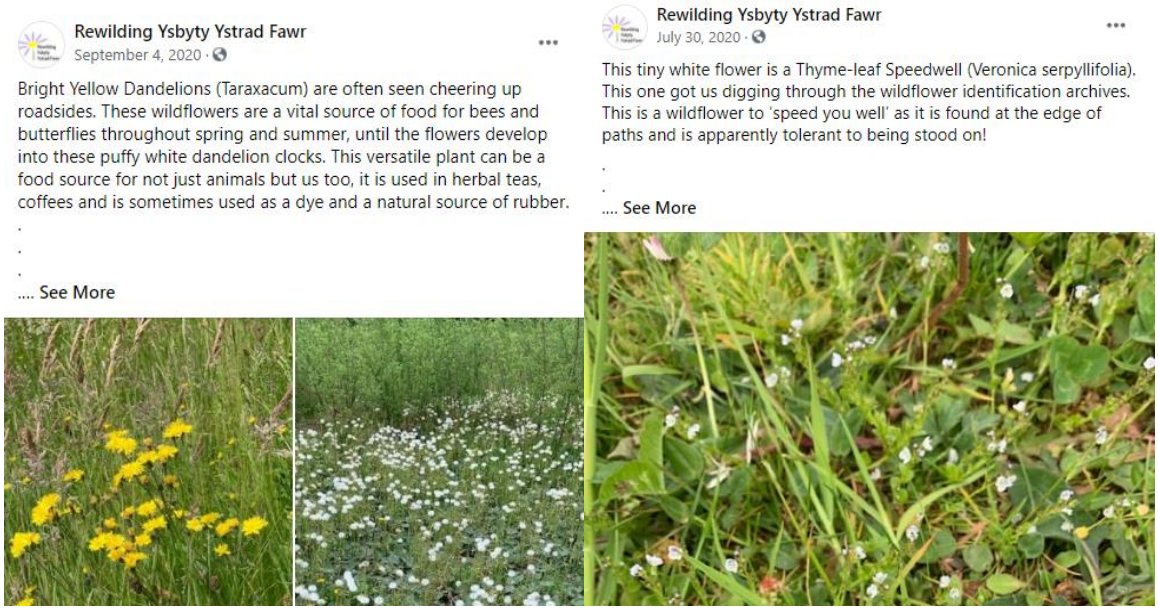


Figure 5.12 Facebook posts from the Rewilding Ysbyty Ystrad Fawr Social media

5.3.3 Results: Feedback from Social Media

The results of the social media online engagement showed that people liked the rewilding project. For Facebook, the most-liked post gained 5 'likes' on Instagram the most liked post gained 14 'likes' and on Twitter 1 'like' was given to the most liked post. Facebook analytics showed the post with the widest reach, caught the attention of 115 people, with more than 6 other posts reaching around 100 people (see Appendix P). There were no comments left on any of the posts by the researcher across all the platforms.

However, a Facebook post by the projects NHS Staff correspondents at YYF was posted on the Ystrad Mynach Facebook page and received reactions proving to be this project's most commented post (see figure 5.13). As this correspondent was part of the project development team, the researcher requested if analysis could be carried out on this public post, consent was given and an analysis of the comments to the post in figure 5.13 are presented here. Thirty-one comments were made, all of which were positive in the encouragement of the rewilding project. A thematic analysis of the comments associated with this post reveals the online communities' views on the project. The results are presented below and have been coded into themes as shown in Table 6.1.

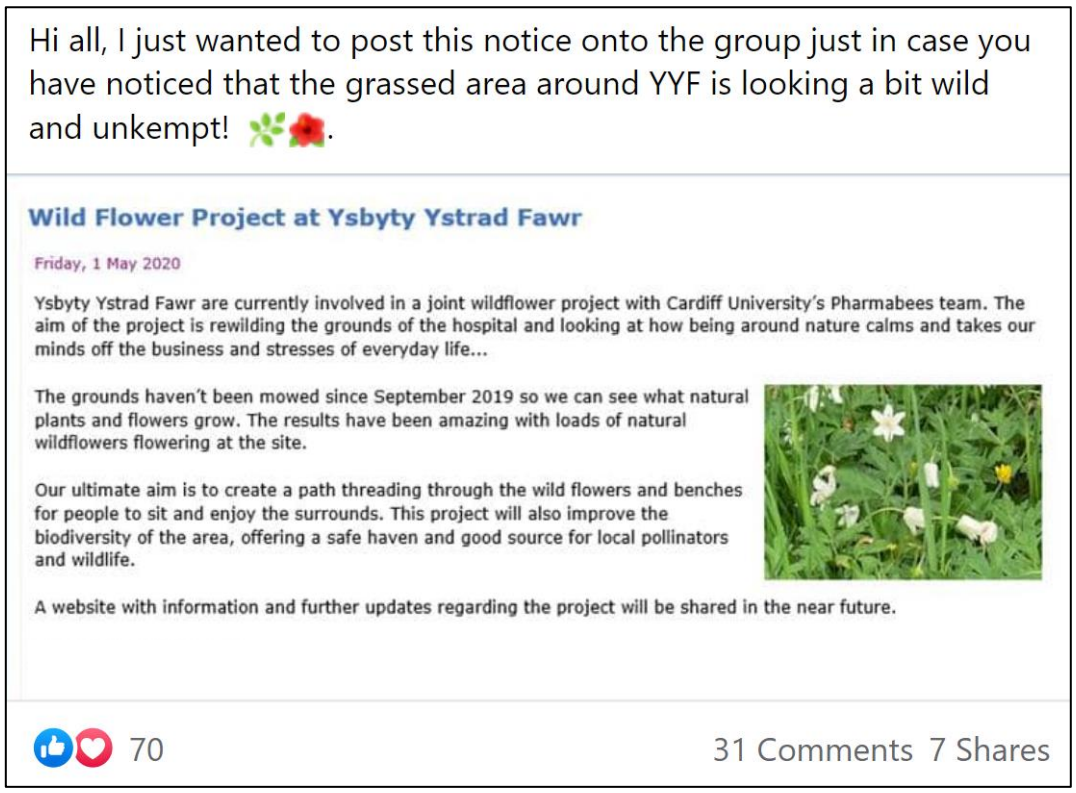


Figure 5.13 – A Facebook post shared by NHS staff green space project collaborators

Table 5.1 The themes and subsequent number of social media interactions of social media engagement post.

Thematic Descriptor	Number of social media comments
a. Demand for rewilding projects	7
b. Appreciation of the rewilding projects	8
c. Effects of Wildflowers	4

There were no negative comments posted on any of the social media platforms.

a. Demand for Rewilding Projects

The demand for Rewilding projects was a common theme and many Facebook users noted that the development of wildflower green spaces should be encouraged as they would benefit the whole community. Many comments that more projects like this are needed for example:

"Well done. We can all help by doing the same in our gardens and encouraging the council to do the same"

Comments were made inspired by the project noting how rewilding could be implemented easily in communities if verges on the roadside were left to rewild by themselves.

"I only said the other day, I hope they leave some of the verges grow naturally as much prettier and much better for the wildlife, I am loving seeing them"

These comments reflect that responders liked the rewilding project and would like to see similar projects in the community.

b. Appreciation of the wildflower project

Many of those who commented on this Facebook post demonstrated their appreciation of this project and they liked that it focused on wildflowers with, posting saying *'Well done* and *'Brilliant idea'*. This positive reaction from the Facebook users shows the project support from the community.

"Love this what a wonderful idea I absolutely love wildflowers"

"The best gardens are wildflower gardens"

c. Effects of wildflowers

Facebook users noted the effects of the wildflowers through the return of insects and birds to the area due to the rewilding project. They also recognised that the biodiversity of flowers was important for pollinators.

“Fantastic. I have seen lots of finches and insects since the wildflowers have been allowed to return here”

“It's beautiful! Welsh poppies, columbine, vetches and so much more for the bees to enjoy”

Users also commented with anecdotes of their own experiences with wildflower planting relating the development of the site to personal green space garden projects.

“Had a wild patch in our garden, it's amazing really to see the amount of Bee's and butterflies that are attracted that side of the garden”

“I’m having a new flower bed in the garden and I have purchased "bee bombs" they are basically bags of wildflower seeds that need no real care or attention and will help attract wildlife!”

In conclusion, these comments on the project post are encouraging, users are showing their support and enthusiasm for the project especially with the development of wildflowers and are recognising that wildflower meadows are beneficial to the environment in terms of the biodiversity of plants and animals. The online project engagement shows that even though users couldn’t visit the site, the enthusiasm behind its establishment was still very much present.

5.4 Long term goals and project legacy

5.4.1 Background

A review of the green space project was undertaken by semi-structured interviews with two YYF NHS staff members who were involved in the project's development. This data was captured so that the green space project could be evaluated. This review aimed to collect critical feedback on opinions, experiences of the green space project and to discuss future plans for the project.

5.4.2 Methods design

A Semi-structured interview was chosen as the method for collecting qualitative data over a focus group as only 2 participants would be interviewed. Adams and Cox (2008) Describe how a focus group should include at least 3 participants therefore was not considered appropriate. The sample consisted of 2 NHS staff members who were involved in the green space project from conception. This sample of participants was selected as they had intimate knowledge of the project's development, whilst also experiencing the green space growth as they both worked full time in the YYF building.

Ethics approval from Cardiff University Research Pharmacy Ethics Committee was granted on 08/01/2020 SREC reference: 1819-25 (see Appendix J). Participants were sent a recruitment email (Appendix Q, provided with an information sheet see Appendix R and signed a consent form see Appendix S before taking part in the interview.

A topic guide for the semi-structured interview provided a discussion framework and is included in Appendix T. The discussion topics covered included, planning period, difficulties, benefits, how the green space was used, how to promote the green space and future ideas. However, as this was a semi-structured interview the interviewer allowed for some flexibility in discussion topics.

The interviews were conducted remotely via a video call on Microsoft Teams®. Audio was recorded via a handheld Dictaphone. The interview was guided by the topic guide and finished with a prompt for any further comments, thanking the participants and ending the recording. The recording was transcribed ad verbatim immediately after the interview and checked against the audio recording for accuracy (Widodo, 2014). The audio recording was subsequently deleted.

The data was analysed by inductive thematic analysis utilising the six-step method, detailed by Braun and Clarke (2006) as described in detail in chapter 2.5.2. The results of this are detailed below.

5.4.3 Results and discussion

The analysed themes from the thematic analysis are illustrated in table 5.2. Due to the qualitative nature of this data the resulting themes and discussion of the interpretation of these themes are combined. A general discussion of the results from all sections of this chapter is presented in 5.5.

Table 5.2 Thematic analysis themes and subthemes emerging from semi structured interviews with YYF correspondents.

THEMES	SUB-THEMES
1. Green space engagement	a. Community use of the Green space
	b. Staff use of the Green space
3. Project reflection, future directions and legacy	a. Reflecting on the rewilding process
	b. Future plans for the green space
	c. Supporting the project
	d. Informing people about the project

1. Green space engagement

a. **Community use of the Green space**

Rewilding of the Hospital fitted well with accidental rewilding of verges in Caerphilly (due originally to council workforce restrictions in the COVID-19 pandemic (Caerphilly County Borough, 2020)) and with the wildflowers that had been planted or had regrown naturally in the verges. It was noted that this proliferation of roadside wildflowers had occurred in many areas across Caerphilly and that the concept of rewilding had attracted attention.

> *"Because of the lockdown a lot of the verges were left to grow wild and a lot of the roundabout islands were left to naturalise and I think some of them had done similar and had wild flowers in them."*

This is concurrent with the findings from the social media comments, discussing how the verges that had been left to wild due to workforce restrictions were actually preferred by some in the community and that a possible future route could be to connect the rewilded site to the council-owned verges to create more areas for green space biodiversity.

The interview discussion noted how vital the green space was to the local town's Ystrad Mynach community as there were few alternative local green spaces for the public to access and enjoy and there were no natural green spaces for the population to interact with unless they were to leave the town to access the mountains outside.

> *"They're trying to build on every green space. We are* (The YYF green space) *the biggest green spaces in this area at the minute, apart from the mountains."*

*"(*The grass) *You got across the road is the plastic grass, isn't it, and you've got to balance. I think you've got the 4G pitch that's just artificial totally (*the neighbouring sports facility*). And then you've got us at the other end of the scale which is good, I think. I Keep pointing that out".*

This lack of local green space is an important consideration and highlight why green spaces and particularly biodiverse green spaces should be protected by the local community. As there is a lack of green space in the local area, the space at YYF could be valuable for both wellbeing and biodiversity, as discussed in the environmental findings of the rewilding.

The interviews also revealed the lack of green space in the local area which led to many non-hospital visitors using the green space to exercise and relax. This unintended consequence shows how valuable green space could be to the wellbeing of to not just the hospital community but also the community of Ystrad Mynach as a whole.

"People who live around this area, they get to benefit from it whether they like to benefit from it. And I think a lot of people do. We see that quite a bit, People are coming down the road you know, they're running, they're walking, they're walking their dogs, they are going off to the park. The kids are in there running around."

"People use it all the time. People are walking their dogs there right now. I think people, I think they stick around. I mean, I walked around the site today just to get some fresh air and there were two people sitting on the bench having their lunch."

It was noticed by staff that local residents visited the green space area, most likely because it is the only local green space as discussed above. The local community were using the green space for a range of activities, this suggests that the space is a local asset for health and recreation.

"Without lockdown restrictions, I can imagine the area would be used all the time."

The popularity of the site suggests that when lockdown restrictions are lifted the green space can be used by the whole community.

When lockdown restrictions prevented visitors from entering the hospital, the rewilded green space was enjoyed by people who had transported patients to appointments or who were waiting to pick patients up.

"And then the steps (daily step counting), and then for visitors from a fitness point of view, so if you bought somebody to the clinic or doctor's appointment, of course, they weren't allowed to come in with the patients. And then really realistically, most patients were on their own

unless they needed help. So it means that people rather than sitting in the cars, we're able to sit on the benches outside"

This demonstrates how even with lockdown restrictions visitors to YYF were able to enjoy the space. Due to the benches being outside, people not permitted inside the building could benefit from the green space and wouldn't have to wait in the car park but could enjoy the green space.

This theme indicated that due to the lack of local green space, the local community used the green space as an area for recreation, for physical activity, for rest and just for fresh air. This is encouraging as increased access to green space is important especially for places that have limited availability. Ward Thompson et al. (2016) discuss the relationship between stress levels and quantity of green space in deprived urban neighbourhoods. They found general health levels were predicted by physical activity and frequency of visits to green space. This suggests that increased access to green space could lead to a healthier lifestyle. Coombes et al. (2010) found that people who lived close to green spaces were more likely to take part in physical exercise and less likely to be overweight or obese. The interview feedback suggests communities around YYF are already visiting the green space, exercising and appreciating the green space. This could be due to the lack of other green spaces in the local area, however, demonstrates that the community are interacting with the green space. This increased use could be due to green spaces and their effects on wellbeing, it could be due to limited green space in the local area or it could be due to the interviewees being more aware of taking note of people in the green space as they were involved in the development, therefore, it is difficult to generalize findings.

b. Staff usage of the Green space

The ability to go somewhere that was outside of the building in the fresh air that was a natural setting was reported to be important for staff particularly in the context of the COVID-19 pandemic as outside made social distancing easier and PPE was not necessary for interactions between staff.

"From a staff perspective, the ability to go outside and go to other places, because you had to socially distance, actually was benefited for the better and probably more people used outside then than any of the year that I've been here. I'm just seeing them all, outside because it has been warmer, they had a nice summer as well. That went into the evening that people on long shifts, you know, could go and have their you know, break and could go somewhere to sit down that was quite nice."

The green space proved even more important during the COVID -19 pandemic as it provided easier social distancing and a less contagious environment, COVID -19 having been shown to transmit less

readily outdoors (World Health Organization, 2021). Providing an area of rest and relaxation for staff breaks was valuable in that it provided a place for staff to have a break in a place slightly separate to the hospital. Witkoski and Dickson (2010) describe how booster breaks help nurses to feel more refreshed when returning to work.

> *"I think from a wellbeing point of view, I think we offered a lot of people some, you know, some respite outside of the confines of being inside."*

The benefit of the green space being outside may have aided relief from stress as being in the green space provided some separation and therefore detachment. Reeve et al. (2017) Discuss how a hospital garden even when still within the building provide a necessary time out from the medical setting. They found restorative and relaxing effects reported from staff patients and visitors. This positive influence green spaces have in hospital settings is demonstrated in the present study.

> *"Any member of staff who was, who are able to go outside and sit on those benches and sit by the flowers, if they haven't benefited from it, I don't know a single person that would have said not because we all got into the whole thing with the masks and pinnys [apron] and the sanitising and to go outside and to just have some air is so gifted."*

This response emphasises the effect of medical settings dealing with the COVID -19 pandemic and suggests that added stress had some relief by spending time in the green space. Newson et al. (2020) found similar findings in that NHS staff benefited from green spaces especially during the current stressful health crisis.

> *"So I think from a wellbeing point of view, I can't, as I said, I think of all the staff, there isn't any member of staff that hasn't used outside at some point, and that doesn't get some enjoyment out. I see lots of my doctors use it, they love it when the weather's dry. And I love to see them out together because I think it's lovely that they can support each other and take time out and have a chat over a cup of coffee. And that's you know, fantastic."*

The social support of the medical staff has been shown to have a relationship with the ability to handle stress levels (AbuAlRub, 2004). The ability to have an area where staff can support each other is essential during stressful working conditions. The staff usage of green space may also have been coincidentally enhanced by sunny weather during summer 2020, access and use is easier without the need for extra clothing or waterproofing. The reduced infection risk within the rewilded area allowed PPE to be removed which in turn enhanced interactions between staff allowing them to support each other's mental and physical wellbeing and creating an apparent distancing from the stress of the work environment.

This Improvement in staff wellbeing also aids patient wellbeing and is, therefore, an important general benefit to the hospital community.

> *"There's no point in trying to fix people from a health point of view, if the place is a concrete jungle, there's no way for anybody to go and get any solace or respite or relaxation."*

In conclusion, rewilding of the green space around YYF proved to be a valuable tool for aiding staff wellbeing by providing a separate space for support and respite this green space may have been used by many staff members to relieve stress.

2. Project reflection, future directions and legacy

a. Reflecting on the rewilding process

When discussing the project, it was agreed that rewilding the land had been a success and that staff at the hospital were encouraged by the new development of a more natural environment.

> *"Then everybody was saying how nice it was and that actually was better, with you know, they wanted to leave it (as a rewilded green space)"*

The rewilding resulted in an increase in biodiversity in the area, particularly noted was the increase in the number of bees that had appeared in the area.

> *"Trying to make it nice for them. For that purpose, birds, insects, bees, there were loads of bees, we would go out and have a little walk around and there would be loads of bees. And we know that there's a lot of hives around by us. So that was really, you know, that that was really encouraging"*

It was noted that the rest of the site didn't have many pollinator plants before the rewilding these are necessary food for insects possibly explaining the increase in bees that were observed.

The increase in biodiversity included an increase in bird species for example Pied Wagtails which came to roost in the eaves of the hospital roof. The staff also mention sheep which came to graze on the land and reflected on a fox track running through the green space meadow.

> *"Sit in an area that's more managed, then you'd go in one of the courtyard, the courtyard. Yeah. You know, so and that's what, that's what you would do. And there's not a lot in there that are pollinators"*

"We notice an increase in insects and bees mind we do. Yeah. Definitely. There were definitely more. There was definitely more going on with that Fox track"

These reports of increased biodiversity were reported by these staff members at multiple time points however it is encouraging that other staff members liked the rewilding project.

b. Future plans for the green space

With the increase in pollinators in the wildflower meadow, plans to further improve the ecosystem in the area were discussed.

"And I still haven't given up on the idea of having bees, yeah. I think they've just been such a gift for what we've got round here, with the river and all of that wilderness down there as well. And with the other bees in the area," ….. "I think it would just be given just a natural progression then, it's a perfect place, really."

Placing managed beehives in the area would provide local places for the bees to proliferate and to live encouraging more bees to the wildflower area. This in turn would increase the wildflower population as the pollination provided by the bees would increase fertility in the green space area. More wildflowers would increase opportunities for further pollinators that need conservation such as the solitary bee (Penn et al., 2019).

When reflecting on the rewilding project and observing what would happen to the grass if it was left in a rewilded state, indicators for future directions of the project were discussed.

"And its kind of like, you know, we're starting the project again. But we've got a bit of background now. And we know what worked and what went well. And we can build on that."

The aim of this pilot study was achieved in that the accessible rewilded green space improved the wellbeing of the NHS staff at Ysbyty Ystrad Fawr. There were many unanticipated positive results including increased biodiversity and the well-being benefits of a much needed accessible green space for local people and hospital visitors alike. The knowledge gained will be invaluable when planning the future use of green spaces to maximise their beneficial impact. When the NHS staff correspondents at YYF were asked what future activities were needed a formulated project plan evolved.

"Now that I've seen what it's like when it's left to go wild. I'm not so worried about having (it) like a proper garden area"

The current green space project has built confidence in project partners about how to develop the green space.

"I think we need to know we need professional assistance to sow the seeds"

A learning step for project partners is the scale of the green space project, now with experience of sowing seeds by hand, professional assistance would allow the wildflowers to be sown into designated areas.

"My thoughts going forward is what I would want to do, is do it properly and do some really long borders as well, with proper wildflower seeding I think that would look (good)."

Plans for some of the green space to be more structured so that the diversity of wildflowers are grown and not outcompeted by the grassland.

"Yeah, and then the rest of the ground we could just do the same. We leave it if it gets cut in the spring and then we learned (that) it just grows through all through the summer and at the end of the summer they cut it in the autumn and bail it and if they did the same with a more flowered patch and I think that would be as close as we could probably get to a really, you know, wild insect environment."

Future clarity into how the space could look and what would be needed. It was acknowledged that support in this project is needed as the scale of the project is more fully realized.

c. Supporting the project

Organisation and management of future iterations of the project would be a necessity, and lessons learned from this project will be used to inform a future roadmap.

"The most interesting thing about it was how much other stuff then became available to us through doing this one simple act"

By engaging with this green space project, resources and networks were realised that were previously unheard-of.

"I signed us up for NHS forests because we have over 100 trees onsite"

One such resource network is NHS forests which is a programme designed to encourage green spaces to healthcare professionals.

"From an environmental impact. It's been fantastic. It's certainly (opened) a lot of doors for us"

The project has benefited these staff members to know what is available.

"We had a man from the environmental department, saying all of this went towards meeting our targets for the Welsh Government's NHS green strategy"

"We hadn't realised that there is this sort of, green champion person for the, for the Health Board, we didn't even know they existed. And again, they said, you know, please get in touch with because we can do more work. We know we can work with you. There's probably loads of stuff that he could get involved with or he could support us with, certainly with some of the contract work, probably" "(He) could catapulted us into something else, bigger and better".

This project has opened doors to the NHS staff partners as through advertising the project, individuals have come forward with previously unknown benefits which encourages hope for the future of the project to develop.

"I think we've learned that people would support it. So that's a very positive. I think we've learned this bigger than just two people. Yeah. So I think it's gotten to be built into the general workings of the hospital, on an on an annual basis. And I think that has to be done professionally. So I think that we definitely learnt that. And I think I think we've learned as well, there's a lot of support out there. I think there's a lot of there's a lot of groups, there's a lot of organised projects, there's charities, there's lots of things out there that we could we could tap into that would make this much more successful and easier. So it's about just doing that now"

The encouragement is given and the revealed potential for official and more extensive support for the rewilding pilot study was acknowledged to be of significant importance. Extending involvement beyond that of the correspondents and researchers currently involved would enable the green initiative of the rewilding project to become more sustainable. It is hoped that this would create a legacy to continue the rewilding project beyond the time period of this MPhil study.

"But one of the problems with us really is that it's so great that it's so low impact what we're doing, but then that's a risk in that if you know, we'll disappear. It's so low impact, it could just disappear project could go back to the way it was and maintenance could be like, we'll cut it again. So yeah, having something substantial, will be really good for sustain that definite next move"

The interviewees revealed concerns that the wellbeing benefits of the rewilding project would disappear if the cutting of the grass were to recommence by default. This points to the need for green space champions or other members of staff who proactively get involved to continue the projects legacy.

"The lack of drive if we weren't here, I think is real risk to it."

The risk of the project disappearing is real. The lack of current engagement means that without the two NHS project partners, the green space project would no longer exist. This danger highlights that that advertisement is needed to raise community awareness of the rewilded green space and to alert more people to the project. Additional team members would be needed to supplement the rewilding project and ensure its survival and progression.

d. Informing people about the project

Reflections on previous advertising were useful when considering how to inform staff, visitors and the community. Despite the COVID -19 pandemic which had prevented hospital visitors for over a year, engagement with the community online via Facebook, had proven to be a success. Even more successful was the digital noticeboard "the carousel" for internal hospital staff which was found to be highly engaging and interactive.

> *"And then we put something on the carousel as well. And then that really kicked everything off. People were really interested then"…" it is easy to get the message out and to let people know what we're doing and why we're doing it"*
>
> *" Facebook for everybody else and intranet for the internal sort of staff is good way of promotion to sort of get the message out"*

Utilising these communication networks again to advertise the project may encourage more people to actively get involved in the project. By getting more people on board information about and legacy of the project can be shared and sustained.

5.5 General discussion of the rewilding project

This green space project aimed to create a green space for well-being that would benefit staff patients and visitors. Despite the limitations of the COVID -19 pandemic, in that the researcher could not access the YYF site (From March 16th 2020 onwards) and had limited correspondence with NHS project collaborators the rewilding method of developing the green space led to findings in increased biodiversity, increased green space usage by both the community and NHS staff and informed future directions of the project.

The findings presented in this chapter suggest that by rewilding the green space, increased biodiversity was observed. Wildflower growth in a broad variety of species and the observed increase in wildlife such as species of birds insects and larger mammals such as the sheep, foxes and squirrels was appreciated and observed in the Facebook post comments and by the NHS staff collaborators. Rewilding an area by allowing reinstatement of more natural vegetation has obvious benefits for biodiversity and conservation (Carver, 2007). The present research results support this and suggest a relationship between increased biodiversity and positive attitudes towards the green space specifically towards wildflowers and increased animal species.

Increased biodiversity has been shown to predict increased psychological restorative effects. A study by Wood et al. (2018) found that in areas of higher biodiversity participants also reported increased restorative qualities. This suggests that the green space at YYF could have had an increased restorative value after rewilding due to the increased variety of flora and fauna. Indeed the demand for more green spaces to be rewilded, as seen in the Facebook comments and interviews, was present implying that green space users were maybe even subconsciously aware of the environmental and wellbeing benefit of the rewilded green space as a place for restoration and healing. The variety of benefits provided by healing gardens is discussed in full by Alkaisi et al. (2021). Many benefits are listed such as benefits physical benefits by promoting physical health, psychological benefits such as improved wellbeing, social benefits such as social interaction, cognitive benefits, enhancing focus, environmental benefits, supporting spiritual beliefs by connecting with nature and economic benefits such as minimizing healthcare costs. These findings suggest the green space at YYF could lead to many benefits not observed or suggested in the present study and that a further evaluation would be valuable. The findings in the present have implications for future projects by supporting the finding that biodiversity for wellbeing is an important consideration for green space conservation and development and that green spaces as healing environments lead to many benefits.

Public use of the green space suggests implications that local residents and visitors to the hospital could benefit from the green space. Key results from the interviews show that the community in the local area around the hospital benefited not only from the restorative effects of a biodiverse landscape but also as public green space is limited in this area. The community were observed utilising the green space in a similar way to a public park for example by dog walking and exercising. This observation of increased use of green space for exercise could be due to the green space being a more accessible option since rewilding as with the addition of benches, people were encouraged to use the land. Coombes et al. (2010) discuss how the accessibility of green space is a predictor of physical exercise and therefore wellbeing. By increasing accessibility physical activity could have been encouraged. However, an argument could be made that as lockdown restrictions limited outdoor exposure, the

green space may have been the only place for local residents to exercise. Inferences about the rewilding project encouraging community use cannot be made as residents may have had no other option for exercise.

The final key finding from the interviews is NHS staff use of the green space. This data was the original aim of the study and although experiences and attitudes of the green space were not collected directly from all staff members, the observational report from the interviews imply that the green space was vital for staff and provided an area of relaxation and social support in a place accessible in work hours. These findings imply there is value in recommending further study of the effects of this particular green space on YYF NHS staff. A valuable study conducted by the Centre of sustainable healthcare investigated the value of green spaces at NHS sites for staff wellbeing (NHS Forest, 2020). In this yearlong study (Newson et al., 2020) the researchers focused on three NHS sites with green space initiatives already in place. The study found nearly 90% of interviewed staff reported wanting to spend more time in green spaces. Staff that did regularly spend time in green spaces reported positive effects on mental and physical wellbeing. These included feeling relaxed and calm and restorative feelings, such as feeling refreshed and reenergised, reporting that they were more effective when returning to work from the green space. This year-long study did not inform the methods or research aim of the current study as it was published towards the current project end. However, findings from this report and the observations from the current study align. The findings from the present research and the NHS Forest (2020) study highlight the importance of access to green space within hospital sites for the wellbeing of NHS health workers, patients and the hospital local community. Recommendations for further practice involves increasing access to and conservation of green space on hospital sites with private rest areas for staff to encourage a supportive environment for health and wellbeing.

A methodological criticism of the research carried out, was that all correspondence and final reflective interviews were only undertaken with the two staff members closely involved in the co-production and development of the green space project. This may lead to a bias in results collected from the semi-structured interviews as involvement in the conception and development of the project could mean that observational results could be overstated. Ideally, this research would have been conducted collecting opinions and attitudes to the green space from the entire community within and around YYF including other staff members, visitors, patients and local residents. However, due to the limitations of COVID-19, this was not possible. Future research would address these populations in their interaction with the green space.

5.6 Conclusions

In conclusion, the rewilding project was a success in meeting the aims of developing a place that not only improved people's wellbeing but also enhanced the environmental diversity of the ecosystem. The benefits of having a green space in a medical setting proved invaluable to the community both in and around YYF. As mentioned in the interviews with hospital staff, this project has meant that the green space could be used as a peaceful space, to exercise, socialise and enjoy being outside in nature. By rewilding the area, the biodiversity of the local ecosystem increased noticeably, this brought animals and plants into the site which could then be further enjoyed by the community.

Going forward, there needs to be more involvement from other staff members at YYF to continue the project legacy. Planting new seedbeds with more wildflowers and ensuring that this project is sustainable will engender community support and engagement. This could be achieved using online social media platforms that will inform and involve the general public in the rewilding project development. It is evident from the project feedback received through social media so far that the public and staff both view the project as being worthwhile. The next step will be to ensure the long-standing sustainability of the project so that it can continue to aid the wellbeing of the community.

Chapter 6 Discussion

This final chapter presents the conclusions of the research described in this thesis discussing how the aims of the research were met, evidence and conclusions drawn, and suggestions for future work.

6.1 Review of Research Aims

The research aims of this thesis as described in the introduction (Chapter 1.5) were:

1. To design and evaluate a tool to assess wellbeing in relation to green spaces.
2. To create a green space at an NHS hospital site Ysbyty Ystrad Fawr, (YYF) from which staff, patients and visitors can benefit, and within which the tool can be tested.

These aims were met through 2 distinct research projects, the design, piloting and evaluation of the wellbeing tool (Chapter 3, design phase 1 and Chapter 4, design phase 2) and the co-design, development and reflection of the green space at YYF for wellbeing.

This thesis describes how the aims have been met, through the iterative design and evaluation of the tool as described in Chapters, 2, 3 and 4:

1. Design of a tool to assess wellbeing in relation to spending time in green space; evaluation of this tool through a two phase pilot study, whilst collecting feedback on the design format and measures; modification of the tool through an iterative process to produce a final tool design.

and the co-creation of the green space at YYF as described in Chapter 5.

2. Creating a wellbeing green space on the site of the YYF through a coproduction approach ; engaging the community online through social media and collecting feedback on green space use and impact on wellbeing through interviews.

6.2 Research findings

This thesis describes the evaluation of two different research projects in the design and evaluation of the wellbeing tool and the co-production of a green space. There are links and similarities between the results in chapters 3, 4 and 5 which have been analysed and are discussed below.

Physical wellbeing

Testing the second iteration of the wellbeing tool (chapter 4) led to a recommendation that the Heart rate (HR) measure be removed due to lack of experimental control . The variable intensity of physical exertion affected increases in cardiovascular activity, as discussed by DuPont et al. (2020). Therefore heart rate data cannot be regarded as directly representative of the effect of green spaces on stress levels and physiological measures such as measuring HR are not appropriate for the final tool.

Results from the semi-structured interviews with NHS staff suggest that the rewilded green space was/is used for physical exercises such as running and dog walking and therefore data collected on types of physical activity could be beneficial to the wellbeing evaluation. Green spaces provide opportunity for physical activity as reflected in the research (Twohig-Bennett & Jones, 2018), which has been shown to positively affect both physical and mental health. It has been suggested as being more enjoyable, motivational and perceived as easier than exercise indoors (Gladwell et al., 2013). This finding informs recommendations that encourage and promote exercise within the green space of the hospital site. Usage could be measured through questioning from tool iteration 2 which asks about the type of physical activity and exertion, and would provide levels of activity occurring in the green space.

Previous research discusses concerns about the environment for exercise and suggest that a polluted environment can lead to absorption of pollutants whilst exercising (MacBride-Stewart et al., 2016). The research concludes that although there is evidence to support the dangers of inhaling pollutants, it is better to inhale and exercise than to not exercise. As the YYF hospital is surrounded by roads (see figure 5.2 in section 5.2.1) this concern of air quality must be considered. Increasing the biodiversity of the green space with trees and vegetation reduces concentrations of air pollutants (Dadvand et al., 2012) by absorbing and storing carbon dioxide through sequestration (Litschke & Kuttler, 2008; Nowak et al., 2006), trapping air pollutants (Wolch et al., 2014). Therefore the more biodiversity of the green space, the less air pollution there will be and the benefits of physical exercise in green space will increase exponentially. This research adds value to the development of the green space and the tool with which to measure the benefits.

Social wellbeing

The social trust question was eliminated in the first tool evaluation (phase 1). It was found to be confusing for participants due to its scale and an inappropriate fit for the current wellbeing measurements. Social wellbeing was not the primary aim for the wellbeing tool and it was concluded that the WEMWBS provided sufficient socially related questions.

However, the results from NHS staff in the semi-structured interviews revealed that social cohesion played a significant role for NHS staff. The results showed that the green space outside was an important place for NHS staff to support each other. This social cohesion for medical staff has been found to be an important factor in staff retention (Joshua-Amadi, 2003), and can be assumed to be a vital resource and support system for healthcare staff during the COVID-19 pandemic. The opportunity for the restorative and aesthetic value of green spaces to provide a place to get away from everyday demands (Hartig, 2008), highlights the need for green spaces. They have been shown to enhance a sense of community, (Kim & Kaplan, 2004) which is essential in places of high stress, such as hospitals, where social support of staff, patients and visitors is needed most. These findings of the research suggest that although the social trust question was not the appropriate measure, there is value in measuring social wellbeing in relation to green space.

The Interest in Green Spaces

Consistently across the research presented in this thesis green spaces have been found to be of personal interest to participants and could be due to sample bias as mentioned in chapters 3 and 4. The research utilised convenience sample methods where participants volunteered themselves for this study and this could have led to responder bias, Hazel et al. (2016). The study invitations described the research topic as relating to green space and wellbeing, therefore personal interest in nature may have motivated participants to volunteer. This personal interest in nature was revealed in the tool evaluation research and was especially prevalent in the semi-structured interviews with NHS staff, a population who were involved in the co-production design of the green space. Richardson et al. (2016) discussed how a greater connection with nature, leads to heightened personal interest and therefore more motivation to take part in research around nature and green spaces. Pritchard et al. (2020), found that those with high nature connectedness benefited from higher improvements in wellbeing when in a green space. This evidence suggests that people who have a higher nature connectedness score may benefit more from spending time in green spaces and are more likely to engage with green spaces and relevant research.

However, an argument can be made that since the COVID-19 pandemic, this interest and appreciation of nature and green spaces is not only experienced by those with nature connectedness. The beginning of the COVID-19 pandemic in Europe, March 2020 saw a dramatic increase in the use of green spaces for wellbeing (Poortinga et al., 2021). Informal nature engagement increased (Lemmey, 2021), as green spaces were used as areas for exercise (Slater et al., 2020), green space users visiting once or more than once per week were shown to have higher wellbeing (Huerta & Utomo, 2021). Olsen and Mitchell (2020) found that during the COVID-19 restrictions of April to June 2020, people reported overwhelmingly that the green spaces benefited their mental health, many indicating that they will make use of green spaces in the future. This need for green spaces to increase wellbeing could have affected the participants in the present research as the results showed that participants reported that their wellbeing had been significantly impacted at the time of measurement and therefore may not be representative of usual wellbeing.

Significant impact on wellbeing is valuable to examine in itself as the wellbeing of study participants could have been impacted by the strains of the COVID-19 pandemic in a prolonged period of uncertainty (Cheng et al. (2021); (Khan et al., 2020). Venter et al. (2020), found that outdoor recreational activity increased dramatically during the lockdown, a result contradicted by Burnett et al. (2021), who found that fewer people visited green spaces than before due to travel restrictions and the risk of public areas.

The research at YYF suggests that the popularity of using green spaces increased due to the need for outdoor 'escape' from the COVID-19 pandemic. The rise in understanding and appreciation of green spaces for wellbeing may have impacted on the research interaction by the general public and could suggest that it is no longer just those with nature connectedness that benefit from green spaces. Nevertheless it is difficult to determine with certainty whether the tool measured increase in wellbeing directly caused by green spaces or by the COVID-19 pandemic related 'escape' from being indoors during 'lockdown' although the data it gathered is appropriate and valuable. A scale measuring nature connectedness is suggested for future research such as the Connectedness to Nature scale (Mayer & Frantz, 2004) which utilises 14 questions on a 5 point Likert scale and could be easily included in the wellbeing tool and would add context to the data.

6.3 Strengths and limitations

As discussed throughout this Thesis, the COVID-19 global COVID-19 pandemic caused significant challenges throughout this research. Section 1.7 described how the tool was originally proposed to be piloted by NHS staff at Ysbyty Ystrad Fawr so that the tool and green space on the grounds of the hospital could be developed at the same time. This would have provided staff with an opportunity to engage with nature and measure wellbeing. Unfortunately, the COVID-19 pandemic prevented the original research plan from moving forwards due to lack of access to NHS sites and staff. Instead, the development of the wellbeing tool was piloted with Cardiff university staff and postgraduate students. This was a limitation, as the research tool was designed to be utilised by NHS staff with slightly differing needs (as discussed above) and as a consequence, the green space was not standardised across pilot study participants. This could have presented confounding effects as the characteristics of the green space were not measured and highlights a difficulty within research measuring wellbeing in natural settings.

Measuring research in a laboratory setting would allow for the control of extraneous variables (Falk & Heckman, 2009), however, as spending time in green spaces can be an everyday part of life especially for relaxation and wellbeing, using a natural field experiment is a more appropriate experimental design (Harrison & List, 2004). The lack of control in study procedure of this natural experiment may have resulted in variable wellbeing measures as the researcher was unable to control for confounding factors due to COVID-19. A significant effect was found in the variable results of HR measurements and led to the recommendation of removing this measure.

However, as this present research utilised a pilot study approach aimed at collecting tool evaluation data, it can be assumed that variability in green spaces did not adversely affect the gathering of evaluation data, but rather the wellbeing feedback held within the sample of data questioning used.

The pilot study iterative process selected to evaluate the tool design was a strength in this research and proved a valuable and vital process as the tool could be evaluated and refined through 2-phases of evaluation. The iterative design ensured that although variability in green space may have been present, feedback on this confounding factor was evaluated in tool iteration 1 and tool iteration 2. This informed developmental changes in the tool to account for variability in activity spent within green space.

The COVID-19 pandemic also lead to modifications to the original plan of the Greenspace at YYF. The original research project plan was to develop a space specifically for staff wellbeing, allowing for the

green space to be rewilded. The process of rewilding was a strength of the project as it required minimal intervention, and allowed for flexibility in the evolving COVID-19 pandemic when only essential NHS staff were allowed to visit the site. Despite little intervention, the benefits were great, increased biodiversity, engagement through social media from local residents and NHS staff revealed that the rewilding process had a positive impact on the whole area. Although the COVID-19 pandemic limited any non-natural development of the site (such as putting in seats and flower borders) and researcher interaction with the site and staff this project has shown its positive impact through the semi-structured interviews with NHS staff. The building of a relationship with NHS staff has been a significant strength of the research as this has allowed for the development of a future project, revisiting the green site for further development that has been informed by lessons from this present research. COVID-19 pandemic although being a limitation to the research may have resulted in increased use of green spaces, as mentioned in section 5.5 the interviewees noted a significant increase in use. As discussed above in section 6.2 this result may be due to the increase in appreciation of green space for wellbeing but also as it provided a place for mental restoration and social support of NHS staff (as discussed in section 5.5). This point highlights the need for green spaces for wellbeing especially during a time of significant stress in medical settings.

6.3.1 Strengths and limitations of research methodology

This research was limited by small sample sizes as the COVID-19 pandemic lead to a change in the study population.

- convenience sampling methods were used to collect participants for the tool evaluation via advertisements on digital university staff and postgraduate student platforms.
- green space project evaluation was conducted through interviews with the 2 green space NHS project collaborators.

The limitation of small sample size affects the data strength, although two phases of the pilot study were conducted, there were small population numbers (n) of only n=11 (Chapter 3) and n=33 (Chapter 4). The sample used for the interviews with healthcare professionals only included two members of staff who were project partners in the design of the wellbeing rewilded grounds, therefore might have had a biased view of the green space and its impact on staff at YYF. However, at the time this research was carried out, other members of staff could not be contacted for interviews due to COVID-19. Nevertheless, small sample sizes in pilot studies are acceptable as this data is used to inform larger-scale studies with statistical value (Hertzog, 2008). Future tool design should be tested on a larger sample size and with more than one population to provide increased data power. By sampling Cardiff

university staff and postgraduate students, these pilot study's findings are only generalizable to these specific populations. Therefore it is advisable for future studies to pilot the tool on their study population first to ensure it is appropriate. For example the tool should be piloted on NHS Staff and evaluated for appropriateness before implementation in future work with NHS sites.

Furthermore, another limitation of pilot study phase-1 was the academic calendar. This phase utilised Cardiff university staff as its population and was carried out in a three-month period from May to August 2020 during which academic staff might have been too overloaded with exam marking to take part or absent due to COVID-19 related home schooling and school holidays. Phase-2 was carried out from December to January which is also a time for holidays and leave, again affecting the number of responses and quality as this can be a time for poor weather, high stress and less relaxation in green spaces.

However, a strength of the research methods used throughout this thesis is the depth in data collection and analysis. Utilising data analysis methods such as conventional content analyses and inductive thematic analyses, minimises analysis bias as the researcher was able to analyse the data without any preconceived themes in mind. This is a strength of the tool in the qualitative data analysis it enabled as the data indicated themes that informed its next iteration. By collecting both quantitative and qualitative data, the researcher allowed for triangulation of data to be achieved which allowed for results to be compared and inferences to be made from the findings. This strength in data is demonstrated above in 6.2, as the research found commonalities across all areas of research, therefore advocating for the tool as a valuable data gathering resource.

6.4 Recommendations for the practical application of the tool

Suggestions for further work and practical application of the tool are discussed here. These include recommendations from chapters 3, 4, 5 and this current chapter 6 as discussed in the research findings 6.2 above. To utilise the wellbeing tool in further studies the researcher should follow these recommendations.

Future Research Design

- It is recommended that this final tool iteration should be piloted before use in a large scale study to ensure that the tool is appropriate for the study population.

- Future studies investigating the effects of green space on wellbeing should include a control group in studies or should at least use a longitudinal study design to accurately measure cause and effect. Longitudinal designs will allow changes in wellbeing over time to be measured.

Future tool delivery layout

- Future studies should have clear study design instructions if using a before and after the methodology and delivering the wellbeing tool in a natural setting, without an experimenter present.
- Future delivery of the tool should be through using a Web app, as this will allow for completion of the tool on any computer device with an internet connection, both a PC and a handheld device.
- Use radio buttons where appropriate instead of tick boxes.
- The use of smiley faces must proceed with caution. Further research is needed into the comparison of the effects of colours on smiley face scales. The suggestion is that researchers should evaluate whether the smiley faces aid responses from their study population more than simply using the descriptive Likert scale. However, if smiley faces are used they should be used with the descriptors as well.

Future tool design

- Validated wellbeing measures - Future studies utilising the wellbeing measures in this tool should consider that the WEMWBS and the SWEMWBS are better suited to longitudinal studies that measure pre and post-intervention with at least a week in-between. For measuring wellbeing within short timescales these questions are not as appropriate. Similarly, the ONS4 questions are also better suited to longitudinal studies measuring time points at least a day apart. However as suggested in 4.4, the creation of an altered scale that uses current time scales measuring wellbeing 'today' could be used and validated.
- Physical wellbeing evaluations could be useful in future studies, however, further research is needed on the accuracy of heart rate measurements in representing stress levels. Instead, the recommendation is to use questions relating to exercise and physical exertion within green spaces. Questions around types of activity within a green space could also be included.
- Further questions relating to green space characteristics should be included as the tool is being utilised in many different green spaces. Characteristics could include, size of green space, diversity of vegetation, locality to home or work and overall frequency of visits to green space.

- Recommendations for questions relating to a personal interest in green spaces would be valuable. This could accompany the inclusion of the Connectedness to Nature Scale (Mayer & Frantz, 2004) and may help identify biases in population sampling and self-selection bias.
- It is recommended that social wellbeing is an important factor for NHS staff, future studies should attempt to measure social wellbeing in greater depth.

6.5 Recommendations the Green space project at Ysbyty Ystrad Fawr

The success of the rewilded space and the relationship between Cardiff University and NHS staff at YYF has to lead to further funding to support the development of the Green space project. Recommendations to carry forward from this project include:

Communication

- Inform and update staff, visitors and the community on the green space project to highlight that it is an active project.
- Updates through the NHS staff intranet and Facebook were recommended for this.

Engagement

- Engage a group of NHS staff invigorated by this green space project with 'Nature Champions' to continue the project's legacy.
- Engage with contacts and networks gained through this pilot project.
- Engage the local community beyond the Hospital in aspects of the greening effort.

Green space design plans

- Plant new seedbeds in long boarders with more wildflowers.
- Investigate acquiring a beehive for the hospital.
- Use professional assistance to sow the seed and bale the grassland.
- Develop a quiet private area for staff reflection.
- Install informal seating to increase staff relaxation and interaction.

6.6 Researcher reflections

Throughout the planning and implementation of this research, the researcher made every effort to maintain the integrity and trustworthiness of the data. In order to minimise the potential of researcher bias and to validate the quality of research strategies the researcher engaged in weekly discussions with two supervisors regarding each stage of research and results. However, data collection, analysis and interpretation was solely carried out by the researcher and as a consequence potential themes may have been overlooked. Although the researcher revisited the data several times to ensure the themes were appropriate and the data was reported accurately, the data may have been reported through unknown bias of the researcher. The interview skill of the researcher skill may have progressively improved with each interview (Adams & Cox, 2008) and this may have been reflected in the data. However as only 3 interviews were carried out, and each interview was aided with a topic guide, it can be assumed that there was little difference between interviews and no significant changes in behaviour conducting the interviews was noted. The researcher skill in the analysis of large data transcripts may similarly have improved with experience. In order to reduce the researchers own bias and ensure that data analysis was conducted appropriately, the researcher followed directions from the 7 stages of conventional content analysis by Hsieh and Shannon (2005) and the 6 phases of thematic analysis as described by Braun and Clarke (2006). Although data analysis was repeated, the researcher further developed this skill during the study, therefore it is important to recognise that sources of bias may be present within the data analysis. The researcher reflects on the experiential learning and professional development that has resulted from this present research project with the development of skills including but not limited to, scientific literature review, survey design, the consideration of ethical implications, conducting interviews, analysis of large qualitative data sets, social media management, hospital garden design, the rewilding process, remote working in unprecedented time and lastly project management.

6.7 Conclusions

Considering the wealth of literature investigating the impact of green spaces on health and wellbeing and the findings of this current study the undisputed conclusion is that green spaces are beneficial to overall health and wellbeing.

This current study aimed to assess subjective wellbeing in a quantifiable and repeatable way through the development of an easily accessed wellbeing assessment tool. Through this research there are clear indications that green spaces are beneficial to all aspects of wellbeing including mental, social, physical, and environmental.

This pilot study has developed a tool to assess wellbeing in relation to spending time in green spaces. Recommendations for the tool advise that piloting the final iteration is essential and could be improved by recommendations addressed in this thesis. A green space for wellbeing at YYF was developed with plans to continue this project and develop the green space further in a co-production approach. This will provide benefits in increasing access to green spaces for wellbeing, in line with the Future Generations Act Wales (2015)(Future Generations Commissioner for Wales, 2021). A finalised and piloted tool will be useful to evaluate wellbeing in relation to specific and general green spaces. Findings from future studies may inform services and policy decisions as to the financial and societal value of green space initiatives for health and wellbeing

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Appendices

Appendix A

Survey and tool iteration 1 as delivered to participants

Investigating the association between subjective well-being and green spaces: a feasibility study: Phase 1

Page 1: Information

This project is a feasibility study to help find the best ways to investigate the effects of green spaces on subjective wellbeing, informing in a future large-scale study.

Our original research plan was to use a sample of NHS staff to evaluate this survey, however in light of the Covid-19 threat we have adapted this study to professionals working from home. We are using this opportunity of the current working situation to evaluate these measures, investigating whether spending time in green spaces has a positive impact on wellbeing.

- **If you are happy to take part in this project (after reading and understanding the information provided) we would like you to complete 2 phases of online questionnaires. We would ideally like you to complete these questionnaires both before and after spending time in a green space.**

- **Firstly please complete this Phase 1: 3-part online anonymous questionnaire.** This will include a short demographic questionnaire section (e.g. age group, staff group), a heart rate measure and three well-being questionnaires. **There will be space to comment as we would like to know what you think of these questionnaires.** Completing all 3 sections should take no longer than 15 minutes.

- From this point onwards, we would like you to use **the Phase 2 questionnaire link to complete a shorter version of the questionnaire.** This contains a short version of the wellbeing questionnaires, the heart rate measure. **We would like you to complete this questionnaire before and after spending time in a green space and should take you less than 10 minutes to complete.** Please repeat this questionnaire at times most convenient to you. You may complete this survey as often as you like but we would appreciate it if it was completed at least once every 3 weeks.

- **There will be an opportunity at the end of the study period to take part in optional follow up interviews. If you would like to take part in these, please follow the link at the end of the Phase 2 questionnaire.**

- For the heart rate measure no special equipment is needed to measure heart rate – as long as you have a smart phone with a camera and a torch, you will be able to use a free smart phone application called 'Instant Heart Rate'. (Directions on how to download this app will be provided at that question. You are also welcome to use your own devices, such as smart watches or a fitbit to measure your heart rate. You do not have to participate in this section if you would not like to.

- After each section of the questionnaire, there will be space for you to tell us what you think about the questionnaire so we know how we could improve the questionnaires in the future (e.g. *'I think Question x is irrelevant for this kind of research', 'The answer choices didn't include what I wanted to say', 'I think this questionnaire is good', The questionnaire only took xx minutes', 'I did not understand Question x', I think you should include a question about xx'*).

- **The aim of this project is to collect feedback on the appropriateness of the tools which will then inform a larger study measuring the impact of spending time in green spaces on the subjective wellbeing of Healthcare professionals. We would like you to focus on evaluating these tools and their appropriateness for collecting data over time in a longitudinal design.**

- **You may decide to stop completing the questionnaires at any time.**

Page 2: Consent Form

If you have further questions about this study or your rights, or if you wish to lodge a complaint or concern, you may contact the study researcher

To confirm that you freely consent to complete the questionnaire, please read the below statements.

If you agree with all of them then please click on the "I Accept" button to confirm your consent and begin the questionnaire. If you have any questions about any of these statements, then please contact the researcher using the email address above.

- **I confirm that I have read the information sheet (Version 7.0, dated April 2020) and fully understand what is expected of me within this study.**
- **I confirm that I have had the opportunity to ask any questions and have them answered.**
- **I understand that I am not obliged to take part in this study and that I can withdraw my agreement at any time.**
- **I understand that I can ask for any information I provide to be withdrawn provided I do this before the findings are analysed (approximately 4 months after consenting to participate).**
- **I understand that the information from the questionnaires will be anonymised and combined with other participants' responses.**
- **I understand this data may be used in reports, conferences and journal publications.**
- **I understand that data collected during the study may be looked at by authorised individuals from Cardiff University for monitoring purposes.**
- **I permit these individuals access to my data records.**

I agree to take part in the study. ✱ *Required*

○ I accept ○ I decline

Page 3: Participant Number

Please input your given participant number here: (If you have not been given a participant number or cannot locate it, please contact the researcher before continuing the study.) ✱ *Required*

Page 4: Demographic information

This part of the questionnaire will gather demographic information. This type of data can also be collected in a future follow-on study to understand if demographics are related to use of the well-being garden.

Please answer the following questions by selecting the relevant answer (unless otherwise stated).

There will be a 'free text' box at the end of section of the questionnaire to tell us your thoughts about each part of the questionnaire.

Age

Please select exactly 1 answer(s).

- [ ] 18 - 24
- [ ] 25 -34
- [ ] 35 - 44
- [ ] 45 - 54
- [ ] 55 - 64
- [ ] 65 or over

Gender

Please select exactly 1 answer(s).

- [ ] Female
- [ ] Male
- [ ] Other
- [ ] Prefer not to say

Employment

- ( ) Full-time
- ( ) Part-time
- ( ) Other (Please specify

other

Current state of mental wellbeing (self-judged)

- ( ) Very good
- ( ) Good
- ( ) Neutral
- ( ) Poor
- ( ) Very Poor

Please provide some feedback on your thoughts about this questionnaire (e.g. Including ease of completion, time taken, relevance or anything else you think should be included).

Page 5: Spending time outside

As we are investigating how to measure the impact of spending time in green spaces on subjective wellbeing, **we would like you to complete The Phase 2 questionnaire and a heart rate measure both before and after spending time in a green space**, e.g. your garden, a local park, any outside non-urbanised area that has plants.

This Phase 1 questionnaire does not have to be completed before and after spending time outside as it only to gather preliminary data.

Please note that that it is important to uphold latest **Government guidance on social distancing if you are planning to participate. If you plan to use a green space open to the wider public please use your own judgement as to whether you are able to safely access this green space in line with Government guidance.**

Are you completing this preliminary survey before or after spending time outside? (If before please continue onto the next page)

- ○ Before
- ○ After

How long did you spend outside in a green space? (In Minutes)

- ○ 0 - 5
- ○ 6 - 10
- ○ 11 - 20
- ○ 21 - 30
- ○ 31 - 45
- ○ 46 - 50
- ○ 1 Hour
- ○ More than 1 hour

How much did you feel engaged with the green space?

- ○ Very Engaged
- ○ Some engagement
- ○ Neutral
- ○ A little engagement
- ○ No engagement.

Did you spend your time the green space uninterrupted by work?

- ○ Yes
- ○ No

Please use the box below to provide some feedback on your thoughts about this part of the questionnaire (e.g. Including ease of completion, time taken, relevance or anything else you think should be included).

Page 6: Physological measure of general stress

Heart rates have shown potential to reflect changes in stress levels.

If you don't wish to complete this section then you can leave it blank and click to the next section.

As a measure of general stress please use this free app: **Instant Heart rate**

available from app stores for free on all Andriod and Apple hand held devices.

Download and open the 'Instant Heart rate' app.

1. https://apps.apple.com/gb/app/instant-heart-rate-hr-monitor/id409625068
2. https://play.google.com/store/apps/details?id=si.modula.android.instantheartrate&hl=en_GB

1. Place your finger over the camera in such a way that it covers the phone camera.
2. Hold your finger there until the measure has finished.
3. Once the measure has finished please write in the box provided your current heart rate measure.

Please note that this heart rate measure is not to identify any health problems, however if you are concerned, information can be found here, or please speak to your GP:

https://www.bhf.org.uk/informationsupport/how-a-healthy-heart-works/your-heart-rate

Please Insert Your Heart rate:

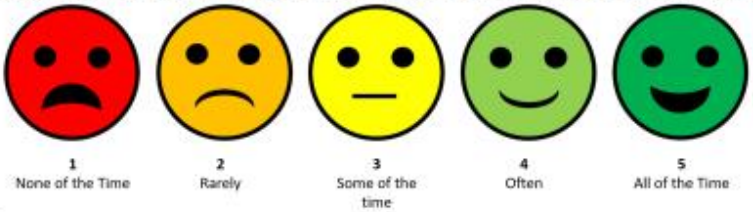
Page 7: Subjective wellbeing

If you feel that you have been affected by these questions, and are concerned about your wellbeing please visit the staff wellbeing page for signposting:

Or contact your line manager or HR representative.

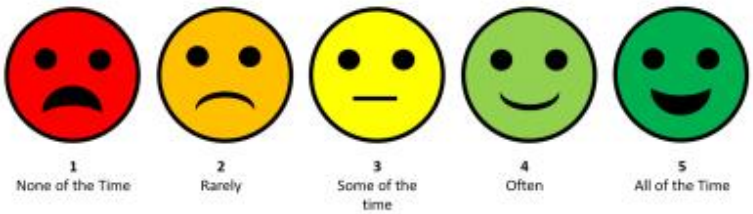
In evaluating your responses to the questions in this survey, we have provided a scale of either 0 to 10 or 1 to 5. To assist you in your responses, smiley faces have also been provided on top of the scales to give you a better idea of what the scores might equate to.

Below are some statements about feelings and thoughts, please choose the number that best describes you experience of each over the last 2 weeks.



Please don't select more than 1 answer(s) per row.

	1	2	3	4	5
I've been feeling optimistic about the future	☐	☐	☐	☐	☐
I've been feeling useful	☐	☐	☐	☐	☐
I've been feeling relaxed	☐	☐	☐	☐	☐
I've been feeling interested in other people	☐	☐	☐	☐	☐
I've had energy to spare	☐	☐	☐	☐	☐
I've been dealing with problems well	☐	☐	☐	☐	☐
I've been thinking clearly	☐	☐	☐	☐	☐



Please don't select more than 1 answer(s) per row.

	1	2	3	4	5
I've been feeling good about myself	☐	☐	☐	☐	☐
I've been feeling close to other people	☐	☐	☐	☐	☐
I've been feeling confident	☐	☐	☐	☐	☐
I've been able to make up my own mind about things	☐	☐	☐	☐	☐

I've been feeling loved	☐	☐	☐	☐	☐
I've been interested in new things	☐	☐	☐	☐	☐
I've been feeling cheerful	☐	☐	☐	☐	☐

Feedback

Did you find the smiley faces helped you in providing your evaluation in this section?

- ○ Yes
- ○ No
- ○ Don't Know

Would you prefer to use the faces alone, without the number scale?

- ○ Yes
- ○ No
- ○ Don't Know

Please provide some feedback on your thoughts about this questionnnaire **(e.g. Including ease of completion, time taken, relevance or anything else you think should be included)**

Page 8: Mental Wellbeing

I would like to ask you four questions about your feelings on aspects of your life. There are no right or wrong answers. For each of these questions i'd like you to give an answer on a scale of 0 to 10, where 0 is 'not at all' and 10 is 'completely'

Please Scroll across the page if you cannot see the entire scale from 0 to 10

Overall, how satisfied are you with your life nowadays?

Please don't select more than 1 answer(s) per row.

	0	1	2	3	4	5	6	7	8	9	10	
Not at all	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Completely

Overall, to what extent do you feel that the things you do in your life are worthwhile?

Please don't select more than 1 answer(s) per row.

	0	1	2	3	4	5	6	7	8	9	10	
Not at all	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Completely

Overall, how happy did you feel yesterday?

Please don't select more than 1 answer(s) per row.

	0	1	2	3	4	5	6	7	8	9	10	
Not at all	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Completely

On a scale where 0 is "not at all anxious" and 10 is "completely anxious", overall, how anxious did you feel yesterday?

Please don't select more than 1 answer(s) per row.

	0	1	2	3	4	5	6	7	8	9	10	
Not at all	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Completely

Feedback

Did you find the smiley faces helped you in providing your evaluation in this section?

- Yes
- No
- Don't Know

Would you prefer to use the faces alone, without the number scale?

- Yes
- No
- Don't Know

Please provide some feedback on your thoughts about this questionnnaire **(e.g. Including ease of completion, time taken, relevance or anything else you think should be included)**

Page 9: Generalised trust question

Please Scroll across the page if you cannot see the entire scale from 0 to 10

Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people? Please tell me on a scale of 1 to 10, where 1 means that you can't be too careful and 10 means that most people can be trusted.

Please don't select more than 1 answer(s) per row.

	0	1	2	3	4	5	6	7	8	9	10	
Can't be too careful	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Most people can be trusted

Feedback

Did you find the smiley faces helped you in providing your evaluation in this section?

- ○ Yes
- ○ No
- ○ Don't Know

Would you prefer to use the faces alone, without the number scale?

- ○ Yes
- ○ No
- ○ Don't Know

Please provide some feedback on your thoughts about this questionnnaire **(e.g. Including ease of completion, time taken, relevance or anything else you think should be included)**

Page 10: End of Preliminary survey

Thank you for taking part in this Phase 1 of the study.

From this point onwards in **Phase 2** we would like you to complete a **shorter questionnaire once before and once after you visit a green space of your choice.**

The Phase 2 questionnaire should take you less than 10 minutes to complete and needs to be completed before and after spending time in a green space.

Please use this link below to access Phase 2 of the study.

Investigating the association between subjective wellbeing and green spaces: a feasibility study: Phase 2

Page 1: Information

The aim of this project is to collect feedback on the appropriateness of the tools which will then inform a larger study measuring the impact of spending time in green spaces on the subjective wellbeing of Healthcare professionals. We would like you to focus on evaluating these tools and their appropriateness for collecting data over time in a longitudinal design.

- If you are happy to take part in this project (after reading and understanding the information provided) we would like you to complete online questionnaires. **We would ideally like you to complete these questionnaires once before and again after spending time in a green space.**
- From this point onwards we would like you to use this Phase 2 questionnaire link to complete a shorter version of the questionnaire.
- This contains a short version of the wellbeing questionnaires, the heart rate measure. **We would like you to repeat this questionnaire using the same website link before and after spending time in a green space.** Completing the questionnaire should take you less than 10 minutes.
- Please repeat this questionnaire at times most convenient to you. You may complete this survey as often as you like but we would appreciate it if it was completed at least once every 3 weeks.
- There will be an opportunity at the end of the study period to take part in optional follow up interviews. If you would like to take part in these, please follow the link at the end of the Phase 2 questionnaire.
- After each section of the questionnaire, there will be space for you to tell us what you think about the questionnaire so we know how we could improve the questionnaires in the future
- You may decide to stop completing the questionnaires at any time.

Page 2: Consent Form

If you have further questions about this study or your rights, or if you wish to lodge a complaint or concern, you may contact the study researcher

To confirm that you freely consent to complete the questionnaire, please read the below statements.

If you agree with all of them then please click on the "I Accept" button to confirm your consent and begin the questionnaire. If you have any questions about any of these statements, then please contact the researcher using the email address above.

- **I confirm that I have read the information sheet (Version 7.0, dated April 2020) and fully understand what is expected of me within this study.**
- **I confirm that I have had the opportunity to ask any questions and have them answered.**
- **I understand that I am not obliged to take part in this study and that I can withdraw my agreement at any time.**
- **I understand that I can ask for any information I provide to be withdrawn provided I do this before the findings are analysed (approximately 4 months after consenting to participate).**
- **I understand that the information from the questionnaires will be anonymised and combined with other participants' responses.**
- **I understand this data may be used in reports, conferences and journal publications.**
- **I understand that data collected during the study may be looked at by authorised individuals from Cardiff University for monitoring purposes.**
- **I permit these individuals access to my data records.**

I agree to take part in the study. ✱ *Required*

○ I accept ○ I decline

Page 3: Participant Number

Please input your given participant number here: (If you have not been given a participant number or cannot locate it, please contact the researcher before continuing the study.) ✱ *Required*

Page 4: Spending time outside

As we are investigating how to measure the impact of spending time in green spaces on subjective wellbeing, **we would like you to complete this short questionnaires and a heart rate measure both before and after spending time in a green space**, e.g. your garden, a local park, any outside non-urbanised area that has plants.

Please note that that it is important to uphold latest Government guidance on social distancing if you are planning to participate. If you plan to use a green space open to the wider public please use your own judgement as to whether you are able to safely access this green space in line with Government guidance.

Are you completing this survey before or after spending time outside? **(If before please continue onto the next page)** * *Required*

- ○ Before
- ○ After

How long did you spend outside in a green space? (In Minutes)

- ○ 0 - 5
- ○ 6 - 10
- ○ 11 - 20
- ○ 21 - 30
- ○ 31 - 45
- ○ 46 - 50
- ○ 1 Hour
- ○ More than 1 hour

How much did you feel engaged with the green space?

- ○ Very Engaged
- ○ Some engagement
- ○ Neutral
- ○ A little engagement
- ○ No engagement.

Did you spend your time the green space uninterrupted by work?

- ○ Yes
- ○ No

Please use the box below to provide some feedback on your thoughts about this part of the questionnaire (e.g. Including ease of completion, time taken, relevance or anything else you think should be included).

Page 5: Physological measure of general stress

Heart rates have shown potential to reflect changes in stress levels.

If you don't wish to complete this section then you can leave it blank and click to the next section.

As a measure of general stress please use this free app: **Instant Heart rate**

available from app stores for free on all Andriod and Apple hand held devices.

Download and open the 'Instant Heart rate' app.

1. https://apps.apple.com/gb/app/instant-heart-rate-hr-monitor/id409625068
2. https://play.google.com/store/apps/details?id=si.modula.android.instantheartrate&hl=en_GB

1. Place your finger over the camera in such a way that it covers the phone camera.
2. Hold your finger there until the measure has finished.
3. Once the measure has finished please write in the box provided your current heart rate measure.

Please note that this heart rate measure is not to identify any health problems, however if you are concerned, information can be found here, or please speak to your GP:

https://www.bhf.org.uk/informationsupport/how-a-healthy-heart-works/your-heart-rate

You do not have to participate in this section if you would not like to.

Please insert your Heart rate:

Page 6: Subjective Wellbeing

This section of the questionnaire should take you no longer than 5 minutes to complete.

There will be a 'free text' box at the end of section for you to tell us your thoughts about this questionnaire section.

If you feel that you have been affected by these questions, and are concerned about your wellbeing please visit the staff wellbeing page for signposting:

Or contact your line manager or HR representative.

In evaluating your responses to the questions in this survey, we have provided a scale of either 0 to 10 or 1 to 5. To assist you in your responses, smiley faces have also been provided on top of the scales to give you a better idea of what the scores might equate to.

Below are some statements about feelings and thoughts, please choose the number that best describes you experience of each over the last 2 weeks.

1 None of the Time | **2** Rarely | **3** Some of the time | **4** Often | **5** All of the Time

Please don't select more than 1 answer(s) per row.

	1	2	3	4	5
I've been feeling optimistic about the future	☐	☐	☐	☐	☐
I've been feeling useful	☐	☐	☐	☐	☐
I've been feeling relaxed	☐	☐	☐	☐	☐
I've been dealing with problems well	☐	☐	☐	☐	☐
I've been thinking clearly	☐	☐	☐	☐	☐
I've been feeling close to other people	☐	☐	☐	☐	☐
I've been able to make up my own mind about things	☐	☐	☐	☐	☐

Feedback

Did you find the smiley faces helped you in providing your evaluation in this section?

- ○ Yes
- ○ No
- ○ Don't Know

Would you prefer to use the faces alone, without the number scale?

- Yes
- No
- Don't Know

Please provide some feedback on your thoughts about this questionnnaire (e.g. Including ease of completion, time taken, relevance or anything else you think should be included)

Page 7: Mental Wellbeing

I would like to ask you four questions about your feelings on aspects of your life. There are no right or wrong answers. For each of these questions i'd like you to give an answer on a scale of 0 to 10, where 0 is 'not at all' and 10 is 'completely'

Please scroll across the page if you cannot see the entire scale from 0 to 10

Overall, how satisfied are you with your life nowadays?

Please don't select more than 1 answer(s) per row.

	0	1	2	3	4	5	6	7	8	9	10	
Not at all	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Completely

Overall, to what extent do you feel that the things you do in your life are worthwhile?

Please don't select more than 1 answer(s) per row.

	0	1	2	3	4	5	6	7	8	9	10	
Not at all	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Completely

Overall, how happy did you feel yesterday?

Please don't select more than 1 answer(s) per row.

	0	1	2	3	4	5	6	7	8	9	10	
Not at all	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Completely

On a scale where 0 is "not at all anxious" and 10 is "completely anxious", overall, how anxious did you feel yesterday?

Please don't select more than 1 answer(s) per row.

	0	1	2	3	4	5	6	7	8	9	10	
Not at all	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Completely

Feedback

Did you find the smiley faces helped you in providing your evaluation in this section?

- ○ Yes
- ○ No
- ○ Don't Know

Would you prefer to use the faces alone, without the number scale?

- ○ Yes
- ○ No
- ○ Don't Know

Please provide some feedback on your thoughts about this questionnnaire (e.g. Including ease of completion, time taken, relevance or anything else you think should be included)

Page 8: Generalised trust question

Please scroll across the page if you cannot see the entire scale from 0 to 10

Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people? Please tell me on a scale of 0 to 10, where 0 means that you can't be too careful and 10 means that most people can be trusted.

Please don't select more than 1 answer(s) per row.

	0	1	2	3	4	5	6	7	8	9	10	
Can't be too careful	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Most people can be trusted

Feedback

Did you find the smiley faces helped you in providing your evaluation in this section?

- ○ Yes
- ○ No
- ○ Don't Know

Would you prefer to use the faces alone, without the number scale?

- ○ Yes
- ○ No
- ○ Don't Know

Please provide some feedback on your thoughts about this questionnnaire (e.g. Including ease of completion, time taken, relevance or anything else you think should be included)

Page 9: End of Survey

Thank you for taking part in this online survey.

Please repeat this survey using this same link before and after spending time in a green space, at a time most convenient to you. You may complete this survey as often as you like and we would appreciate it if it was completed at least once every 3 weeks.

If you would like to take part in a follow-up interview to discuss your experience of completing this survey, please follow this link and input your email address.

Please note that the follow up interview will take place at the end of the study period which will last as long as the current situation demands working from home or August 1st 2020, whichever is soonest.

(Further details are available in the Participant Information Sheet which you were sent at the start of this study).

Appendix B

Overall Research project ethical approval

SPPS Ethics Approval Notification (EAN) 8/9/14 v12

Cardiff School of Pharmacy and Pharmaceutical Sciences, Research Ethics Approval

This form has been signed by the School Research Ethics Officer as evidence that approval has been granted by the Cardiff School of Pharmacy and Pharmaceutical Sciences Research Ethics Committee for the following study:

Project title:	1819-25: Bee Well Caerphilly

This is a/an:	Undergraduate project	
	ERASMUS project	
	Postgraduate project	X
	Staff project	

Redacted

STATEMENT OF ETHICS APPROVAL

This project has been considered and has been approved by the Cardiff School of Pharmacy and Pharmaceutical Sciences Research Ethics Committee

Redacted

(Chair, School Research Ethics Committee)

Appendix C

Phase-1 pilot study ethical approval

SPPS Amendment Approval Notification (AAN) 11/10/14 v1

Cardiff School of Pharmacy and Pharmaceutical Sciences, Research Ethics Approval

AMENDMENT APPROVAL

This form has been signed by the School Research Ethics Officer as evidence that approval has been granted by the Cardiff School of Pharmacy and Pharmaceutical Sciences Research Ethics Committee for amendment(s) to the following study:

Project ref and title:	1819-25: Bee Well Caerphilly

Redacted

The amendment(s) dated 20 Apr 2020 have been reviewed and approved.

Any further amendments will require approval.

STATEMENT OF ETHICS APPROVAL

The proposed amendment(s) have been considered and approved by the Cardiff School of Pharmacy and Pharmaceutical Sciences Research Ethics Committee

Redacted

(Chair, School Research Ethics Committee)

Appendix D

Phase-1 pilot study Information sheet

PARTICIPANT INFORMATION SHEET

Investigating the association between subjective wellbeing and green spaces: a feasibility study

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You are being invited to take part in a research project. Before you decide whether or not to take part, it is important for you to understand why the research is being undertaken and what it will involve. Please take time to read the following information carefully and discuss it with others, if you wish.

Thank you for reading this.

1. What is the purpose of this research project?

Research has suggested that spending even short periods of time in a green space (defined as a vegetated space in an urban area) can lower stress and have beneficial effects on people's wellbeing and health.

This pilot feasibility project aims to evaluate tools which will help us to carry out future research studies investigating any association between NHS staff wellbeing and use of a workplace wellbeing garden.

To do this we would like to obtain feedback on some questionnaires we plan to use to measure subjective wellbeing so that we can evaluate their effectiveness and appropriateness for future studies.

Our original research plan was to use a sample of NHS staff to evaluate these measures, however in light of the Covid-19 threat we have adapted this study to professionals working from home. We are using this opportunity of the current working situation to evaluate these measures to investigate whether spending time in green spaces has a positive impact on wellbeing.

2. Why have I been invited to take part?

You have been invited to take part in this study because you are a member of staff at Cardiff University.

3. Do I have to take part?

No, your participation in this research project is entirely voluntary and it is up to you to decide whether or not to take part. If you decide to take part, we will discuss the research project with you and ask you to sign a consent form. If you decide not to take part, you do not have to explain your reasons and it will not affect your legal rights.

You are free to withdraw your consent to participate in the research project at any time, without giving a reason, even after signing the consent form. Data collected may be

withdrawn at any time up until the end of the study period - August 1st 2020. From this point participants' data will be fully anonymised and therefore impossible to withdraw.

4. **What will taking part involve?**

You will be given a participant number and be asked to complete **Phase 1** of the study, a **preliminary 3-part on-line anonymous questionnaire**. This will include a short demographic questionnaire section (e.g. age group, working status), a heart rate measure and three well-being questionnaires. There will be space to comment as we would like to know what you think of these questionnaires. Completing all 3 sections should take no longer than 15 minutes.

From this point onwards in **Phase 2** we would like you to complete a **shorter questionnaire** once before and once after you visit a green space of your choice.

Please note that that it is important to uphold latest **Government guidance on social distancing if you are planning to participate. If you plan to use a green space open to the wider public please use your own judgement as to whether you are able to safely access this green space in line with Government guidance.**

We would like you to complete this Phase 2 survey at a time most convenient to you. You may complete this survey as often as you like but we would appreciate it if it was completed at least once every 3 weeks. This short questionnaire should take you less than 10 minutes to complete and contains a short version of the wellbeing questionnaires, the heart rate measure. The study period will last as long as the current situation demands working from home or August 1st 2020, whichever is soonest.

The questionnaires are available online and can be accessed via a mobile phone, tablet or computer (however you usually access the internet). No special equipment is needed to measure heart rate – as long as you have a smart phone with a camera and a torch, you will be able to use a free smart phone application called 'Instant Heart Rate'. You are also welcome to use your own devices, such as smart watches or a Fitbit to measure your heart rate.

If participants are concerned about their subjective wellbeing, they should visit the wellbeing pages on the intranet, or contact their line manager or HR representative:

If participants are concerned about their heart rate measure, information can be found here, or speak to your GP:
https://www.bhf.org.uk/informationsupport/how-a-healthy-heart-works/your-heart-rate

In **Phase 3**, which is optional and will take place at the end of the study period, there will be an opportunity to take part in a **follow up interview**. You may volunteer for the interview at any time over the course of the study period however, the interview will be conducted at the end of the study period.

On the final page of the surveys there is a link to ask if you would be willing to take part in a follow-up interview to discuss your experience of using the questionnaires. You can choose not to take part in this part of the study, but if you wish to take part you can click a link to enter your email address and we will get in touch by email to arrange a suitable time to carry out the interview. We will also provide you with a separate consent form which we would ask you to complete and return before being interviewed. The details provided in the consent form will be handled confidentially in line with data protection requirements (see section 9).

In the interview you will be asked about your experiences of completing the questionnaires and any thoughts you might have about ways to improve them. The interview will last approximately 30 to 45 minutes and will be guided by the researcher. It is planned that the interview will be carried out using Microsoft Teams. If you do not have access to this software or would prefer to be interviewed over the telephone you can let the researchers know when we are arranging the interview. The interview will be audio-recorded with a portable dictaphone with your consent, and then will be typed up, at which point any information that might identify you as an individual will be removed. The audio recording will be deleted from the dictaphone after this transcription takes place, anonymising the data.

5. Will I be paid for taking part?

No, participation is voluntary and there is no payment.

6. What are the possible benefits of taking part?

There are no immediate benefits to participants in this study, however the results from this research will gather evidence for the design of a future research study looking at the relationship between spending time green spaces and improving wellbeing of hospital staff.

7. What are the possible risks of taking part?

There is a time commitment involved with taking part in completion of the questionnaires and participating in the optional follow up interviews however, neither parts have to be completed at a set time. There are no anticipated disadvantages, risks or burdens associated with taking part in this study apart from the stated time commitment.

8. Will my taking part in this research project be kept confidential?

All information collected from (or about) you during the research project will be kept confidential and any personal information you provide will be managed in accordance with

data protection legislation. Please see 'What will happen to my Personal Data?' (below) for further information.

9. What will happen to my Personal Data?

Your personal data that will be collected in the questionnaire phase will be your email address in recruitment, your age, sex and employment type. All data that you provide including this demographic information will be pseudo-anonymised. This means that you will be given a participant number, which will be linked to your data, however it is not fully anonymised as the researcher will have means to reidentify of the individual to which the personal data relates. However, this identification document will be known to only to members of the research team (the postgraduate researcher and immediate supervisors) and will be kept secure.

The personal data that will be collected in the optional follow up interview stage will be, your email address to contact the researcher, your consent form and the audio recording of the interview. If the interview is over the telephone then your contact number will also be classed as personal data.
Any email correspondence between you and the researcher, and the record of the organised Microsoft Teams meeting or any record of your contact telephone number (I.e. the interview) will be handled confidentially and deleted after the interview has taken place.

The audio recording on the portable dictaphone will be kept in a locked drawer only accessible to the research team and will be destroyed after the interview has been transcribed. Please note that all identifiable data will be anonymised when the interview is transcribed and all quotes and excerpts will be anonymised in research publications. Please note that after the interview has been transcribed we will be unable to identify and remove your data should you wish to withdraw your data.

Other personal data we collect, such as your consent form will be stored securely in a locked drawer or password protected computer and will be retained for no longer than one year after the end of the study and may be accessed by members of the research team and, where necessary, by members of the University's governance and audit teams or by regulatory authorities.
Cardiff University is the Data Controller and is committed to respecting and protecting your personal data in accordance with your expectations and Data Protection legislation. Further information about Data Protection, including:

- your rights
- the legal basis under which Cardiff University processes your personal data for research
- Cardiff University's Data Protection Policy
- how to contact the Cardiff University Data Protection Officer
- how to contact the Information Commissioner's Office

maybe found at https://www.cardiff.ac.uk/public-information/policies-and-procedures/data-protection

Cardiff University will not share any personal data or non-anonymised data.

Data collection will be from April 2020 and will last as long as the current working from home situation does with a deadline of August 1st 2020. Your online consent will be retained from time of collection for no longer than one year after the end of the study and may be accessed by members of the research team and, where necessary, by members of the University's governance and audit teams or by regulatory authorities. Anonymised information will be kept for a minimum of April 2020 to December 2020 but may be published in support of the research project and/or retained indefinitely, where it is likely to have continuing value for research purposes.

Participants may withdraw from the study at any time and data collected may be withdrawn at any time up until the end of the testing period, when the current working from home situation ends with a deadline August 1st 2020. From this point participant's' data will be fully anonymised and therefore impossible to withdraw.

Personal data collected up until completion of the project or the point of participant withdrawal from the research project, will be kept in a secure location only accessible by the

Redacted

10. What happens to the data at the end of the research project?

The data collected during this research project will be used to determine feasibility of another project measuring the impact of spending time in green spaces on Hospital staff wellbeing. At the end of the study the data will be shared within the university but will be restricted to the researchers of this future project. Any personal or identifiable data will be removed before this sharing takes place.

11. What will happen to the results of the research project?

The data and results of this project will be included in an MPhil thesis and potentially research publications and presentations/posters at research conferences. You will not be identified in any of these documents/presentations, although anonymised quotes from the interviews may be included. If you wish to receive electronic copies of these documents, please contact the researcher to be included on our circulation list.

12. What if there is a problem?

If you wish to complain, or have grounds for concerns about any aspect of the manner in which you have been approached or treated during the course of this research, please contact

the researcher Redacted If you are unhappy with how the project is being conducted, please contact a member of the research team using the contact information at the end of this document. If you feel your complaint has not been handled to your satisfaction and wish to complain formally, you can do this by contacting the Director of Research, Cardiff School of Pharmacy and Pharmaceutical Sciences, Redwood Building, King Edward VII Avenue, Cardiff CF10 3NB, Redacted

If you are harmed by taking part in this research project, there are no special compensation arrangements. If you are harmed due to someone's negligence, you may have grounds for legal action, but you may have to pay for it.

13. Who is organising and funding this research project?

Redacted

14. Who has reviewed this research project?

This research project has been reviewed and given a favourable opinion by the School of Pharmacy and Pharmaceutical Sciences Research Ethics Committee, Cardiff University.

Redacted

Appendix E

Phase-1 pilot study email advertisement

Dear Colleagues,

I am currently undertaking a pilot study as part of my MPhil in partnership with the Aneurin Bevin health board to investigate the impact of green spaces on personal wellbeing.

Research has suggested that spending time in green spaces has a positive effect on wellbeing and reduces stress. This is particularly relevant as we all struggle to adapt to the challenges of home working and social isolation.

In response to the current pandemic we have developed a short questionnaire which seeks to capture your feelings about that period of the day in which you escape from the laptop to experience the great outdoors in all of its verdant wonder.

In addition to capturing data about how you feel you have benefited from exposure to green spaces we are also seeking feedback on the usability of the survey and the questions asked.

Our plan is to use your feedback to help design a much larger study in partnership with a local health board to explore the impact on healthcare professionals working in a hospital setting of spending time in green spaces.

To take part in this pilot study you will need to complete an online baseline survey which takes no longer than 15 minutes to complete. We would also ask you to complete a shorter version of this survey, ideally once every 3 weeks over the study period, before and after spending time outside (this should take no longer than 10 minutes). At the end of the study period there will be an opportunity to take part in an optional, follow up interview. The study will last as long as the current working from home situation lasts or August 1st 2020 (whichever is soonest).

If you are interested in participating please **read the attached participant information sheet** which contains full details about the study.

Redacted

Appendix F

Phase-1 pilot study consent form

Research project title: Bee Well Caerphilly
SREC reference: 1819-25

Consent will be gained electronically; participants will be sent a link hosted by online surveys in order to do this . The electronic consent form will be presented as shown:

INVESTIGATING THE ASSOCIATION BETWEEN SUBJECTIVE WELLBEING AND GREEN SPACES: A FEASIBILITY STUDY

Follow up interview – Consent Form

Redacted

	Please tick box
I confirm that I have read the information sheet dated April 2020 (version 7) for the above phase of the study.	
I confirm that I have understood the information sheet dated April 2020 (version 7) and that I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	
I understand that my participation is voluntary and I am free to withdraw at any time without giving a reason and without any adverse consequences (e.g. to medical care or legal rights, if relevant). I understand that if I withdraw, information about me that has already been obtained past the interview transcription stage may be kept by Cardiff University.	
I understand that data collected during the research project may be looked at by individuals from the Cardiff University Research team or from regulatory authorities, where it is relevant to my taking part in the research project. I give permission for these individuals to have access to my data.	
I consent to the processing of my personal information [This consent form, your contact details and the audio recording of this interview] for the purposes explained to me. I understand that such information will be held in accordance with all applicable data protection legislation and in strict confidence, unless disclosure is required by law or professional obligation.	
I understand who will have access to personal information provided, how the data will be stored and what will happen to the data at the end of the research project.	
I understand that after the research project, anonymised data may be used to determine feasibility of another project measuring the impact of spending time in the green spaces on Hospital staff wellbeing.	

I understand that at the end of the study the data will be shared within the university but will be restricted to the researchers of this future project. I understand that it will not be possible to identify my data and that my data will be used by other researchers, for ethically approved research projects, on the understanding that confidentiality will be maintained.	
I consent to being audio recorded for the purposes of the research project and I understand how it will be used in the research.	
I understand that anonymised excerpts and/or verbatim quotes from my interview may be used as part of the research publication.	
I understand how the findings and results of the research project will be written up and published.	
I agree to take part in this research project.	

Please type your name and date into the box below to confirm consent to participate:

Name: Date:

THANK YOU FOR PARTICIPATING IN OUR RESEARCH

Appendix G

Phase-1 pilot study – topic guide follow up interviews

Research project title: Bee Well Caerphilly **SREC reference:** 1819-25

INVESTIGATING THE ASSOCIATION BETWEEN SUBJECTIVE WELLBEING AND GREEN SPACES: A FEASIBILITY STUDY

Follow up interview (Phase 3) – Topic guide

If participants wish to take part in the follow up interviews at the end of the testing period, they will be linked to an online web page where they can input their email address at the end of the Phase 2.

The researcher will then contact the individual to gain online consent, arrange the interview and send a pdf of the survey questions to remind the participant.

The interviews will be conducted over online voice call, without video and will be recorded on a portable dictaphone.

Introduction

Thank you for agreeing to take part in this follow up interview

As you'll have seen in the information sheet, this pilot feasibility project aims to evaluate tools which will help us to carry out future research studies investigating any association between NHS staff wellbeing and use of a workplace wellbeing garden.

To do this we really want to understand your personal point of view on the questionnaires used to measure subjective wellbeing so that we can evaluate their effectiveness.

You have been asked to take part in this interview to obtain some more detailed feedback so that we can evaluate the survey you have completed. We want your views on the experience of completing the survey, not a discussion about the answers you provided to the survey.

As the survey is work in progress, so you can be as honest as you want to be - please remember that there is no wrong or right answer and that everything you say will be extremely helpful to the project. Please let me know at any point during the session if there is anything you feel uncomfortable with and remember that you don't need to answer any questions that you don't want to. The session will last approximately 30-45 minutes. It will be recorded with a voice recorder *(subject to consent)* to make sure I don't miss any of the information you provide but your identity will be kept confidential, so don't be afraid to speak to me openly.

Topic Guide

Recruitment and information provided

Discuss the recruitment process, the documentation informing the process.

Version 1, April 2020

Research project title: Bee Well Caerphilly **SREC reference:** 1819-25

How did you find the information that was provided about the study? *(Explore answers to clarify / probe – clear or unclear / issues / suggestions to improve etc.)*

How did you find the recruitment process? *(Explore answers to clarify / probe – easy / difficult / complicated / issues / suggestions to improve etc.)*

Study design

Discuss the study design, was the structure of study was this accessible

Survey design

Discuss the data collection tools, were they appropriate to evaluate wellbeing?

What did you think of the survey?

Which sections worked / didn't work? *(Consider the various elements in turn)*

Were they clear? (did the questions make sense? Did you understand the questions? Did you understand the instructions for completion?)

Ease of completion? (Why / why not?) *In relation to the tools but also to the online nature of it – were drop down boxes ok etc.*

Were the questions relevant? (which weren't and why?)

Would you change anything about it? What and why?

Overall

Were there any challenges in participating in the study?

Any further points of interest to discuss regarding the participant's experience?

Do you have any further suggestions how the survey could be improved?

Closing

Thank you for answering my questions.

Is there anything else relating to this topic that you wanted to say but haven't had the chance?

If yes, then explore and check if anything else to add after this.

Explanation of what will happen to personal data and data given in this interview.

Thank you and goodbye

Version 1, April 2020

Appendix H

Phase-1 pilot study follow up interview transcript example

Key:

Interviewer

Interviewee

Interview 1

Transcription began after introductions were made

So the first question, how did you find out about the study?

I think it was on yammer or email, or email about a yammer post.

How did you find the information sheet and email invitation, in recruitment?

I came across it by chance, I saw it was reposted in the Covid volunteer page.

And what drew you toward taking part?

My husband is interested in green spaces, well we both are so I clicked on it to see what it was.

How did you find the recruitment process?

Very straight forward process, I just saw the study through the email and contacted you.

Were there any issues with getting to the survey?

No complications in getting onto survey no.

I wanted to ask about feedback on the structure of the survey, what did you think of the survey structure?

The clicking the button for before or after going to the green spaces, whilst this was relatively straightforward.. but the first time I did it, I was slightly confused but the next few times it was straightforward.

Do you think there is anything to improve it?

Don't I think so

Do you think there was anything thing in the beginning with the demographic bit? Anything missing or unnecessary?

No it all seems fine

Ok thank you, so onto the Tools themselves the heart rate monitor, the engagement with green space questions how did you find them? Did you think they were appropriate?

With the heart rate, some of the time in green space I would be going for a strict walk in park and my heart rate would be up because of the exercise but wouldn't say that that was measuring stress levels I'd say it was measuring exercise level. You should have had a question asking how have you enjoyed your green space, by exercise, resting etc. as the heart rate measure could give misleading answer without this information. It could suggest you come back stressed but could just be tired. It could give misleading answer without this information.

And the questions themselves, refereeing to the 3 wellbeing measures did you think these were appropriate?

Yes very good quite searching questions, the smiley faces were hopeful but I wouldn't want just the smiley faces, they were helpful but if we just had then it would more like a children thing and would feel less academic, the number system feels more serious.

The Trust question was difficult to answer, are you talking about people on Twitter? You can't trust anybody. The local shop? You can trust 9 out of 10 people, not 9 out of 100 so it's difficult to evaluate an overall judgement with how trusting you are with people. Whether it was general personal interactions… yeah this question was difficult

Overall it was good, captured a wide range of feelings and emotions through the approaches , a wide range there. One of the things of how you engage with green space.

How much you engage with green space, was good but needs a question about what kind of green space people are in, different greenness.

Would this be good , then what or where their activity was. But you might end up with more data than you can analyse. It might help to measure how much they have engaged, but what else they have engaged in, measuring people at home isn't a standardised green space.

Maybe come up with a list of categories of what they might be doing, sitting in the garden or walking the dog. There's many ways for people to engage with green spaces and utilising green spaces. especially in lockdown.

How did they engage with green space, I was always in park, usually walking the dog and would do the questionnaire after walking in the woods.

Super, and what Questions or parts of the survey worked or didn't work?

I didn't complete it as many times as wanted to as with the dog getting excited about a walk sometimes there isn't time to complete this. But don't think making the questionnaire shorter would have helped this. I don't think that could get round life happening even if there was a questionnaire that could be answered instantly

Were there any unnecessary questions which could help to make it quicker?

Without the evaluation part this would be quicker, but nothing to pick out that wasn't valid. All was important, Maybe you could divide essence of it?

In order to come up with a good survey the questions have to raise an emotion. It felt like these questions were very good, you haven't asked about anything unnecessary in particular.

Were the questions relevant?

Yes

Would you change anything about it? What and why?

The Heart rate need to sign post to some green space engagement to see if people were exercising. With the trust question perhaps the question could be broken into more than one part. But this might be a personal thing. No problem with the question but is open to interpretation, wide range of answers people have in their minds when answering this.

It seemed Appropriate to have phase 1 and 2 (preliminary and main study) but need to have a clear baseline. But people might not have wanted to complete a long questionnaire both before and after

Overall Were there any challenges in participating in the study?

Trying to remember to complete before I got to green spaced but can't see how we can get round this one either. I Felt happier completing afterwards than getting it done before.

It was easy to use. Having to think about answering these questions is an emotional experience addressing the questions, some people won't want to do this, apart from that very easy to answer. It would be horrible to be asked these questions in person, not framing the answer for the recipient.

Here can give a direct answer more likely to justify an answer, for instance with the survey online, am more likely to be telling the truth when evaluating wellbeing.

I completed this on my work computer, I used a table as I didn't want to sit on the sofa and do it.

And when did you complete the survey?

I only work part time, so I did it on weekdays when I wasn't working. With the engagement with green spaces, it's hard to squeeze into lunch hour and I won't want to do before and after too. But only asking to do it once a week or fortnightly, this would work better when there's more work.

Any further points of interest to discuss or questions?

No, I think that's all.

Thank you for answering my questions.

Recording stopped and the researcher informed the interviewee of the personal data procedures.

Appendix I

Second tool iteration as used in Phase-2 pilot study

Investigating subjective well-being and green spaces: a feasibility study

Page 1: Study Information

INVESTIGATING THE ASSOCIATION BETWEEN SUBJECTIVE WELLBEING AND GREEN SPACES: A FEASIBILITY STUDY

You are being invited to take part in a research project. Before you decide whether or not to take part, it is important for you to understand why the research is being undertaken and what it will involve. Please take time to read the following information carefully and discuss it with others, if you wish.

Thank you for reading this.

1. **What is the purpose of this research project?**

Research has suggested that spending even short periods of time in a green space (defined as a vegetated space in an urban area) can lower stress and have beneficial effects on people's wellbeing and health.

This pilot feasibility project aims to evaluate tools which will help us to carry out future research studies investigating an association between NHS staff wellbeing and use of a workplace wellbeing garden.

To do this we would like to obtain critical feedback on a survey which aims to measure subjective wellbeing, in association with time spent and engagement with green space, so that we can evaluate their effectiveness and appropriateness for future studies.

Our original research plan was to use a sample of NHS staff to evaluate these measures, however, in light of the Covid-19 threat, we have adapted this study to professionals working from home. We are using this opportunity of the current working situation to evaluate these measures to investigate whether spending time in green spaces has a positive impact on wellbeing.

2. Why have I been invited to take part?

You have been invited to take part in this study because you are a member of staff or a postgraduate student at Cardiff University.

3.Do I have to take part?

No, your participation in this research project is entirely voluntary and it is up to you to decide whether or not to take part. If you decide not to take part, you do not have to explain your reasons and it will not affect your legal rights.

You are free to withdraw your consent to participate in the research project at any time. However, all participants' data will be fully anonymised and therefore impossible to withdraw.

4. What will taking part involve?

You will be asked to complete an online anonymous survey. This will include a short demographic questionnaire section (e.g. age group, working status), a measure of engagement with green space and a heart rate measure; well-being questionnaires and a survey evaluation. There will be space to comment as we value your feedback from the survey. **Completing all 4 sections should take no longer than 30 minutes.** The survey will only need to be completed once.

The survey will be open to participants for 2 weeks from the initial advertisement.

No special equipment is needed to measure heart rate – as long as you have a smartphone with a camera and a torch, you will be able to use a free smartphone application called 'Instant Heart Rate'. You are also welcome to use your own devices, such as smartwatches or a Fitbit to measure your heart rate.

Please note that it is important to uphold the latest **Government guidance on social distancing if you are planning to participate. If you plan to use a green space open to the wider public, please use your own judgement as to whether you are able to safely access this green space in line with Government guidance.**

If participants are concerned about their subjective wellbeing, they should visit the wellbeing pages on the intranet, or contact their line manager or HR representative:

Cardiff University staff and Postgraduate students:

Redacted

Or contact your or supervisor.

If participants are concerned about their heart rate measure, information can be found here, or speak to your GP:

https://www.bhf.org.uk/informationsupport/how-a-healthy-heart-works/your-heart-rate

5. Will I be paid for taking part?

No, participation is voluntary and there is no payment.

6. What are the possible benefits of taking part?

There are no immediate benefits to participants in this study, however, the results from this research will gather evidence for the design of a future research study looking at the relationship between spending time green spaces and improving the wellbeing of hospital staff.

7. What are the possible risks of taking part?

There is a time commitment involved with taking part in the completion of the questionnaires but they do not have to be completed at a set time. There are no anticipated disadvantages, risks or burdens associated with taking part in this study apart from the stated time commitment.

8. **Will my taking part in this research project be kept confidential?**

All information collected from (or about) you during the research project will be kept confidential and any personal information you provide will be managed in accordance with data protection legislation. Please see 'What will happen to my Personal Data?' (below) for further information.

9.What will happen to my Personal Data?

All personal data collected will be anonymous. Your personal data that will be collected will be your age, gender and employment type. Cardiff University will not share any personal data.

Cardiff University is the Data Controller and is committed to respecting and protecting your personal data in accordance with your expectations and Data Protection legislation. Further information about Data Protection, including:

- your rights
- the legal basis under which Cardiff University processes your personal data for research
- Cardiff University's Data Protection Policy
- how to contact the Cardiff University Data Protection Officer
- how to contact the Information Commissioner's Office

maybe found at https://www.cardiff.ac.uk/public-information/policies-and-procedures/data-protection

Your online consent will be retained from time of collection (anonymised consent will be collected before participants begin the survey) for no longer than one year after the end of the study and may be accessed by members of the research team and, where necessary, by members of the University's governance and audit teams or by regulatory authorities. Anonymised information will be kept for a minimum of December 2020 to February 2021 but may be published in support of the research project and/or retained indefinitely, where it is likely to have continuing value for

research purposes.

Please note as all information will be anonymous, the data cannot be withdrawn.

Redacted

10.What happens to the data at the end of the research project?

The data collected during this research project will be used to determine the feasibility of another project measuring the impact of spending time in green spaces on Hospital staff wellbeing. At the end of the study, the data will be shared within the university but will be restricted to the researchers of this future project. Any personal or identifiable data will be removed before this sharing takes place.

11.What will happen to the results of the research project?

The data and results of this project will be included in an MPhil thesis and potentially research publications and presentations/posters at research conferences. You will not be identified in any of these documents/presentations, although anonymised quotes from the interviews may be included. If you wish to receive electronic copies of these documents, please contact the researcher to be included on our circulation list.

12.What if there is a problem?

If you wish to complain or have grounds for concerns about any aspect of the manner in which you have been approached or treated during the course of this research, please contact the researcher If you are unhappy with how the project is being conducted, please contact a member of the research team using the contact information at the end of this document. If you feel your complaint has not been handled to your satisfaction and wish to complain formally, you can do this by contacting the Director of Research, Cardiff School of Pharmacy and Pharmaceutical Sciences, Redwood Building, King Edward VII Avenue, Cardiff CF10 3NB,

If you are harmed by taking part in this research project, there are no special compensation arrangements. If you are harmed due to someone's negligence, you may have grounds for legal action, but you may have to pay for it.

13.Who is organising and funding this research project?

Redacted

14.Who has reviewed this research project?

This research project has been reviewed and given a favourable opinion by the School of Pharmacy and Pharmaceutical Sciences Research Ethics Committee, Cardiff University.

Redacted

Page 2: Consent Form

Redacted

To confirm that you freely consent to complete the questionnaire, please read the below statements. If you agree with all of them then please click on the "I Accept" button to confirm your consent and begin the questionnaire. If you have any questions about any of these statements, then please contact the researcher using the email address above.

- **I confirm that I have read the information sheet (Version 9.0, dated December 2020) and fully understand what is expected of me within this study.**
- **I confirm that I have had the opportunity to ask any questions and have them answered.**
- **I understand that I am not obliged to take part in this study and that I can withdraw from taking part in the survey at any time.**
- **I understand that as all data is anonymous I will be unable to have my data withdrawn if I withdraw from the study.**
- **I understand this data may be used in reports, conferences and journal publications.**
- **I understand that data collected during the study may be looked at by authorised individuals from Cardiff University for monitoring purposes. I permit these individuals access to my data records.**

I agree to take part in the study. * *Required*

○ I accept ○ I decline

Page 3: Welcome

This is a feasibility study, meaning we are testing the usability of this survey. **Usually, this survey will be completed before and after spending time in a green space** (defined as a vegetated space in an urban area) to evaluate any changes in wellbeing that might occur. However, **here we value your feedback on how the survey looks and how easy it is to complete.**

The survey will comprise of 4 parts, a demographic questionnaire, a measure of engagement in the green space and physiological measure of stress, 2 subjective wellbeing questionnaires and a final feedback page.

We have also added questions asking for your feedback on this survey throughout so that we can evaluate the efficacy of this as a tool to measure subjective wellbeing before and after spending time in green space.

Please complete the survey and feedback questions at your own pace, however, it should take no longer than 30 minutes.

Page 4: Demographic information

Please answer the following questions by selecting the relevant answer (unless otherwise stated).

Age

Please select exactly 1 answer(s).

- [ ] 18 - 24
- [ ] 25 -34
- [ ] 35 - 44
- [ ] 45 - 54
- [ ] 55 - 64
- [ ] 65 or over

Gender

Please select exactly 1 answer(s).

- [ ] Female
- [ ] Male
- [ ] Other
- [ ] Prefer not to say

Employment

- ( ) Full-time
- ( ) Part-time
- ( ) Postgraduate Student
- ( ) Other (Please specify)

other

Current state of mental wellbeing (self-judged)

- ( ) Very good
- ( ) Good
- ( ) Neutral
- ( ) Poor
- ( ) Very Poor

Page 5: Measure of Engagement in Green Space

As we are investigating how to measure the impact of spending time in green space (defined as a vegetated space) on subjective wellbeing, we would like you to complete these short questionnaires and a heart rate measure both before and after spending time in a green space, e.g. your garden, a local park, any outside non-urbanised area that has plants.

We are aware you may be completing this before spending time outside, please think about the questions and answer the feedback questions

Please note that it is important to uphold the latest **Government guidance on social distancing if you are planning to participate. If you plan to use a green space open to the wider public please use your own judgement as to whether you are able to safely access this green space in line with Government guidance.**

Are you completing this preliminary survey before or after spending time outside? (If before please continue onto the next page)

- ○ Before
- ○ After

How far away from your home or place of work is the green space? (in Miles)

How long did you spend outside in a green space? (In Minutes)

How much did you feel engaged with the green space?

- ○ Very Engaged
- ○ Some engagement
- ○ Neutral
- ○ A little engagement
- ○ No engagement.

Did you spend your time the green space uninterrupted by work?

- ○ Yes
- ○ No

How did you intend to use your green space? (Please select all that are appropriate)

- ☐ Physical wellbeing (through physical activity and fresh air)
- ☐ Mental wellbeing (through stress reduction and attention restoration)
- ☐ Social wellbeing (through social integration, engagement and participation)

Please use the box below to provide some feedback on your thoughts about this part of the questionnaire (e.g. Including ease of completion, time taken, relevance or anything else you think should be included).

Page 6: Physiological measure of general stress

Heart rates have shown potential to reflect changes in stress levels. Please document your Heart Rate immediately before and immediately after spending time in the green space.

Please use the same heart rate monitor both times. A personal heart rate measure such as a Fitbit is encouraged, however, if you do not have access to one of these please use this free app, 'Instant heart rate'.

Please note that this heart rate measure is not to identify any health problems, however, if you are concerned, information can be found here and please speak to your GP.

https://www.bhf.org.uk/informationsupport/how-a-healthy-heart-works/your-heart-rate

If you don't wish to complete this section then you can leave it blank and click to the next section.

As a measure of general stress please use this free app: **Instant Heart rate,** available from app stores for free on all Andriod and Apple handheld devices.

Download and open the 'Instant Heart rate' app.

1. https://apps.apple.com/gb/app/instant-heart-rate-hr-monitor/id409625068
2. https://play.google.com/store/apps/details?id=si.modula.android.instantheartrate&hl=en_GB

1. Place your finger over the camera in such a way that it covers the phone camera.
2. Hold your finger there until the measure has finished.
3. Once the measure has finished please write in the box provided your current heart rate measure.

Please Insert Your Heart rate:

What is your current activity level (within the last 30 minutes)?

- ☐ Resting (sitting or lying down)
- ☐ Exercising (this includes light activity)

If exercising, what level of physical activity?

- ☐ Light activity - (moving rather and sitting or lying down– for example, walking at a slow pace, moving around your home.)
- ☐ Moderate - (Moderate activity will raise your heart rate, and make you breathe faster and feel warmer. One way to tell if you're working at a moderate intensity level is if you can still talk, but not sing.) for example – brisk walking, riding a bike, dancing.)
- ☐ Vigorous intensity activity - (makes you breathe hard and fast. If you're working at this level, you will not be able to say more than a few words without pausing for breath. – for example jogging or running, hiking uphill, tennis or football, energetic dancing.)

If you would like, please describe the activity.

Please use the box below to provide some feedback on your thoughts about this part of the questionnaire (e.g. Including ease of completion, time taken, relevance or anything else you think should be included).

Page 7: Subjective wellbeing

This section comprises validated wellbeing questionnaires;

As well as gathering information for potential modification of the questionnaires, we will also test the feasibility of using these questionnaires in a future study.

- This section of the questionnaire should take you no longer than 10 minutes to complete.
- There will be a 'free text' box at the end of the section for you to tell us your thoughts about this questionnaire section.

If you feel that you have been affected by these questions, and are concerned about your wellbeing please visit the staff wellbeing page for signposting:

Redacted

In evaluating your responses to the questions in this survey, we have provided a scale of either 0 to 10 or 1 to 5. To assist you in your responses, smiley faces have also been provided on top of the scales to give you a better idea of what the scores might equate to.

Below are some statements about feelings and thoughts, please choose the number that best describes you experience of each over the last 2 weeks.

1 None of the Time | 2 Rarely | 3 Some of the time | 4 Often | 5 All of the Time

Please don't select more than 1 answer(s) per row.

	1	2	3	4	5
I've been feeling optimistic about the future	☐	☐	☐	☐	☐
I've been feeling useful	☐	☐	☐	☐	☐
I've been feeling relaxed	☐	☐	☐	☐	☐
I've been feeling interested in other people	☐	☐	☐	☐	☐
I've had energy to spare	☐	☐	☐	☐	☐
I've been dealing with problems well	☐	☐	☐	☐	☐
I've been thinking clearly	☐	☐	☐	☐	☐

1 None of the Time | 2 Rarely | 3 Some of the time | 4 Often | 5 All of the Time

Please don't select more than 1 answer(s) per row.

	1	2	3	4	5
I've been feeling good about myself	☐	☐	☐	☐	☐
I've been feeling close to other people	☐	☐	☐	☐	☐
I've been feeling confident	☐	☐	☐	☐	☐
I've been able to make up my own mind about things	☐	☐	☐	☐	☐
I've been feeling loved	☐	☐	☐	☐	☐
I've been interested in new things	☐	☐	☐	☐	☐
I've been feeling cheerful	☐	☐	☐	☐	☐

Feedback

Please provide some feedback on your thoughts about this questionnnaire (e.g. Including ease of completion, time taken, relevance or anything else you think should be included)

Page 8: Mental Wellbeing

I would like to ask you four questions about your feelings on aspects of your life. There are no right or wrong answers. For each of these questions i'd like you to give an answer on a scale of 0 to 10, where 0 is 'not at all' and 10 is 'completely'

Please Scroll across the page if you cannot see the entire scale from 0 to 10

Overall, how satisfied are you with your life nowadays?

Please don't select more than 1 answer(s) per row.

	0	1	2	3	4	5	6	7	8	9	10	
Not at all	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Completely

Overall, to what extent do you feel that the things you do in your life are worthwhile?

Please don't select more than 1 answer(s) per row.

	0	1	2	3	4	5	6	7	8	9	10	
Not at all	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Completely

Overall, how happy did you feel yesterday?

Please don't select more than 1 answer(s) per row.

	0	1	2	3	4	5	6	7	8	9	10	
Not at all	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Completely

On a scale where 10 is "completely anxious" and 0 is"not at all anxious", overall, how anxious did you feel yesterday?

Please don't select more than 1 answer(s) per row.

	0	1	2	3	4	5	6	7	8	9	10	
Not at all	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Completely

Feedback

Please provide some feedback on your thoughts about this questionnnaire (e.g. Including ease of completion, time taken, relevance or anything else you think should be included)

Page 9: Survey feedback

To what extent do you agree or disagree with each of the following statements? Please select one per row.

This scale should not take more than 5 minutes to complete.

1. I found this survey easy to use.

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree
- Don't know

Please feel free to explain why

2. This survey would be easier if it was in the form of a mobile app.

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree
- Don't know

Please feel free to explain why

3. I am not interested in green spaces or the outdoors.

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree
- Don't know

Please feel free to explain why

4. I would be happy to complete this survey before and after spending time outside.

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree
- Don't know

Please feel free to explain why

5. I would find it difficult to complete this survey both before and after spending time outside.

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree
- Don't know

Please feel free to explain why

Please provide some feedback on your thoughts about this questionnnaire (e.g. Including ease of completion, time taken, relevance or anything else you think should be included)

Page 10: Final Page

Thank you for taking part in this online survey.

Appendix J

Phase-2 pilot study – Ethical Approval

SPPS Amendment Approval Notification (AAN) 11/10/14 v1

Cardiff School of Pharmacy and Pharmaceutical Sciences, Research Ethics Approval

AMENDMENT APPROVAL

This form has been signed by the School Research Ethics Officer as evidence that approval has been granted by the Cardiff School of Pharmacy and Pharmaceutical Sciences Research Ethics Committee for amendment(s) to the following study:

Project ref and title:	1819-25: Bee Well Caerphilly

Redacted

The amendment(s) dated 6 Dec 2020 have been reviewed and approved.

Any further amendments will require approval.

STATEMENT OF ETHICS APPROVAL

The proposed amendment(s) have been considered and approved by the Cardiff School of Pharmacy and Pharmaceutical Sciences Research Ethics Committee

Redacted

(Chair, School Research Ethics Committee)

Appendix K

Phase-2 pilot study – Advertisement

To Recruit Cardiff university staff and postgraduate students, the following email will be sent through these staff channels and Postgraduate email list/groups: PGR, PDRAs, academic staff, professional services staff. This study will also be posted on the same Yammer groups as the previous Phase 1 was, with the following advertisement.

The email advertising participants will contain the following text:

Email subject title: Your views needed, New Research into the impact of spending time outside

Dear Colleagues,

I am currently undertaking a pilot study as part of my MPhil in partnership with the Aneurin Bevin health board to investigate the impact of green spaces on personal wellbeing.

Research has suggested that spending time in green spaces has a positive effect on wellbeing and reduces stress. This is particularly relevant as we all struggle to adapt to the challenges of home working and social isolation.

Your views are needed on how you have felt from exposure to green space. We are also seeking feedback on the usability of the survey and the questions asked.

Our plan is to use your feedback to help design a much larger study in partnership with the health board to explore the impact of spending time in green spaces on healthcare professionals working in a hospital setting.

To take part in this pilot study you will need to complete an online survey. That will take approximately 30 minutes.

Redacted

Advert

Research has suggested that spending time in green spaces has a positive effect on wellbeing. This is particularly relevant adapting to the challenges of home working and social isolation.

Your views are needed on how you have felt from exposure to green space. We are also seeking feedback on the usability of the survey and the questions asked.

To take part in this pilot study you will need to complete an online survey. That will take approximately 30 minutes.

If you are interested in participating, please review the attached participant information sheet attached. And click this link to take the survey

Redacted

Appendix L

Phase-2 pilot study – Participant information sheet

PARTICIPANT INFORMATION SHEET

INVESTIGATING THE ASSOCIATION BETWEEN SUBJECTIVE WELLBEING AND GREEN SPACES: A FEASIBILITY STUDY

You are being invited to take part in a research project. Before you decide whether or not to take part, it is important for you to understand why the research is being undertaken and what it will involve. Please take time to read the following information carefully and discuss it with others, if you wish.

Thank you for reading this.

1. What is the purpose of this research project?

Research has suggested that spending even short periods of time in a green space (defined as a vegetated space in an urban area) can lower stress and have beneficial effects on people's wellbeing and health.

This pilot feasibility project aims to evaluate tools which will help us to carry out future research studies investigating an association between NHS staff wellbeing and use of a workplace wellbeing garden.

To do this we would like to obtain critical feedback on a survey which aims to measure subjective wellbeing, in association with time spent and engagement with green space, so that we can evaluate their effectiveness and appropriateness for future studies.

Our original research plan was to use a sample of NHS staff to evaluate these measures, however in light of the Covid-19 threat we have adapted this study to professionals working from home. We are using this opportunity of the current working situation to evaluate these measures to investigate whether spending time in green spaces has a positive impact on wellbeing.

2. Why have I been invited to take part?

You have been invited to take part in this study because you are a member of staff or a postgraduate student at Cardiff University.

3. Do I have to take part?

No, your participation in this research project is entirely voluntary and it is up to you to decide whether or not to take part. If you decide to take part, we will discuss the research project with you and ask you to sign a consent form. If you decide not to take part, you do not have to explain your reasons and it will not affect your legal rights.

You are free to withdraw your consent to participate in the research project at any time, however, participants' data will be fully anonymised and therefore impossible to withdraw.

4. **What will taking part involve?**

You will be asked to complete an online anonymous survey. This will include a short demographic questionnaire section (e.g. age group, working status), a measure of engagement with green space and a heart rate measure; well-being questionnaires and a survey evaluation. There will be space to comment, as we value your feedback from the survey. **Completing all 4 sections should take no longer than 30 minutes**. The survey will only need to be completed once.

The survey will be open to participants for 2 weeks from the initial advertisement.

The survey is available online and can be accessed via a computer, mobile phone or tablet (however you usually access the internet). No special equipment is needed to measure heart rate – as long as you have a smartphone with a camera and a torch, you will be able to use a free smartphone application called 'Instant Heart Rate'. You are also welcome to use your own devices, such as smartwatches or a Fitbit to measure your heart rate.

Please note that it is important to uphold the latest **Government guidance on social distancing if you are planning to participate. If you plan to use a green space open to the wider public, please use your own judgement as to whether you are able to safely access this green space in line with Government guidance.**

If participants are concerned about their subjective wellbeing, they should visit the wellbeing pages on the intranet, or contact their line manager or HR representative:

Redacted

5. **Will I be paid for taking part?**

No, participation is voluntary and there is no payment.

6. **What are the possible benefits of taking part?**

There are no immediate benefits to participants in this study, however, the results from this research will gather evidence for the design of a future research study looking at the relationship between spending time green spaces and improving well-being of hospital staff.

7. What are the possible risks of taking part?

There is a time commitment involved with taking part in the completion of the survey but they do not have to be completed at a set time. There are no anticipated disadvantages, risks or burdens associated with taking part in this study apart from the stated time commitment.

8. Will my taking part in this research project be kept confidential?

All information collected from (or about) you during the research project will be kept confidential and any personal information you provide will be managed in accordance with data protection legislation. Please see 'What will happen to my Personal Data?' (below) for further information.

9. What will happen to my Personal Data?

All personal data collected will be anonymous. Your personal data that will be collected will be your age, gender and employment type. Cardiff University will not share any personal data.

Cardiff University is the Data Controller and is committed to respecting and protecting your personal data in accordance with your expectations and Data Protection legislation. Further information about Data Protection, including:

- your rights
- the legal basis under which Cardiff University processes your personal data for research
- Cardiff University's Data Protection Policy
- how to contact the Cardiff University Data Protection Officer
- how to contact the Information Commissioner's Office

maybe found at https://www.cardiff.ac.uk/public-information/policies-and-procedures/data-protection

Your online consent will be retained from time of collection (anonymised consent will be collected before participants begin the survey) for no longer than one year after the end of the study and may be accessed by members of the research team and, where necessary, by members of the University's governance and audit teams or by regulatory authorities. Anonymised information will be kept for a minimum of December 2020 to February 2021 but may be published in support of the research project and/or retained indefinitely, where it is likely to have continuing value for research purposes.

Please note as all information will be anonymous, the data cannot be withdrawn.

Personal data collected up until completion of the will be kept in a secure location only

Redacted

possible to withdraw any anonymised data that has already been published.

10. What happens to the data at the end of the research project?

The data collected during this research project will be used to determine the feasibility of another project measuring the impact of spending time in green spaces on Hospital staff wellbeing. At the end of the study, the data will be shared within the university but will be restricted to the researchers of this future project. Any personal or identifiable data will be removed before this sharing takes place.

11. What will happen to the results of the research project?

The data and results of this project will be included in an MPhil thesis and potentially research publications and presentations/posters at research conferences. You will not be identified in any of these documents/presentations, although anonymised quotes from the interviews may be included. If you wish to receive electronic copies of these documents, please contact the researcher to be included on our circulation list.

12. What if there is a problem?

If you wish to complain or have grounds for concerns about any aspect of the manner in which you have been approached or treated during the course of this research, please contact the researcher If you are unhappy with how the project is being conducted, please contact a member of the research team using the contact information at the end of this document. If you feel your complaint has not been handled to your satisfaction and wish to complain formally, you can do this by contacting the Director of Research, Cardiff School of Pharmacy and Pharmaceutical Sciences, Redwood Building, King Edward VII Avenue, Cardiff CF10 3NB,

If you are harmed by taking part in this research project, there are no special compensation arrangements. If you are harmed due to someone's negligence, you may have grounds for legal action, but you may have to pay for it.

Redacted

14. Who has reviewed this research project?

This research project has been reviewed and given a favourable opinion by the School of Pharmacy and Pharmaceutical Sciences Research Ethics Committee, Cardiff University.

15. Further information and contact details

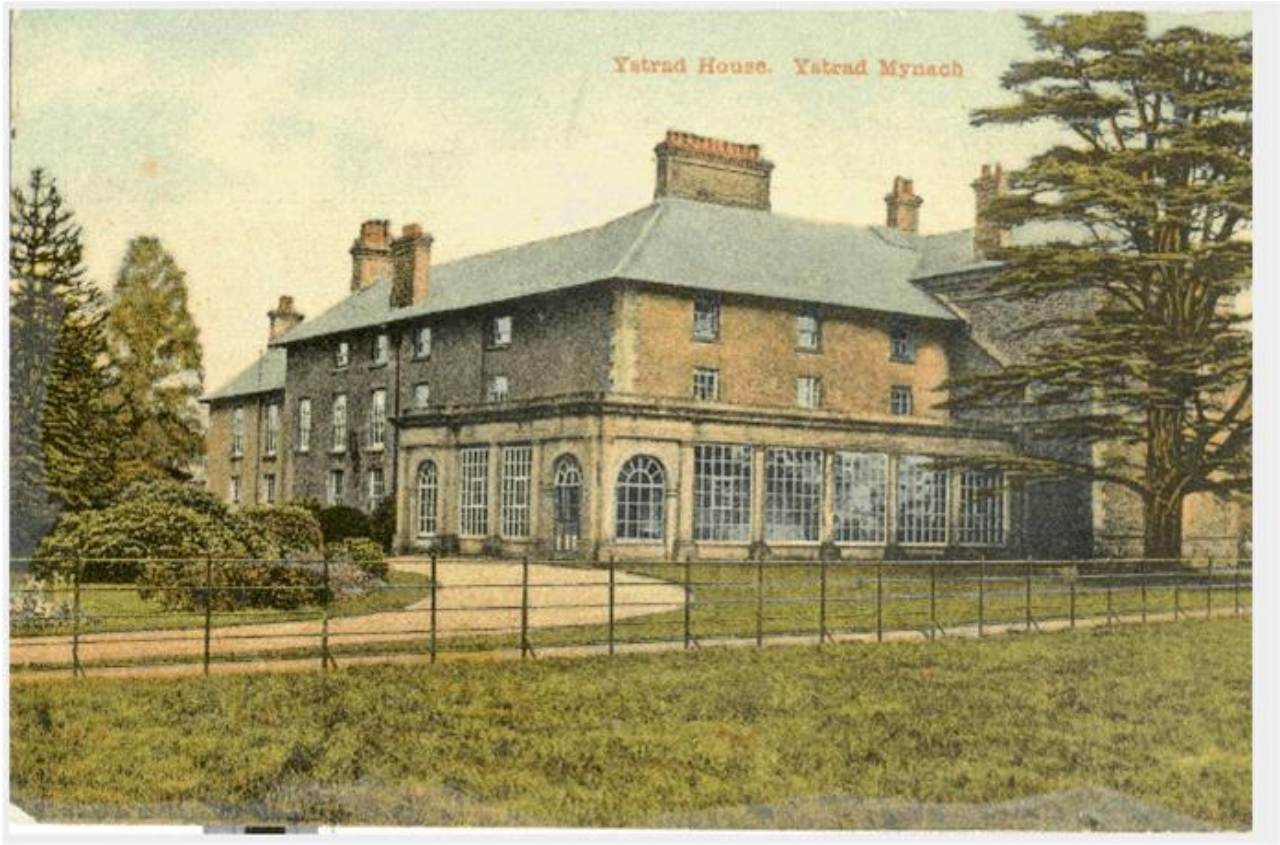
Should you have any questions relating to this research project, you may contact us during normal working hours:

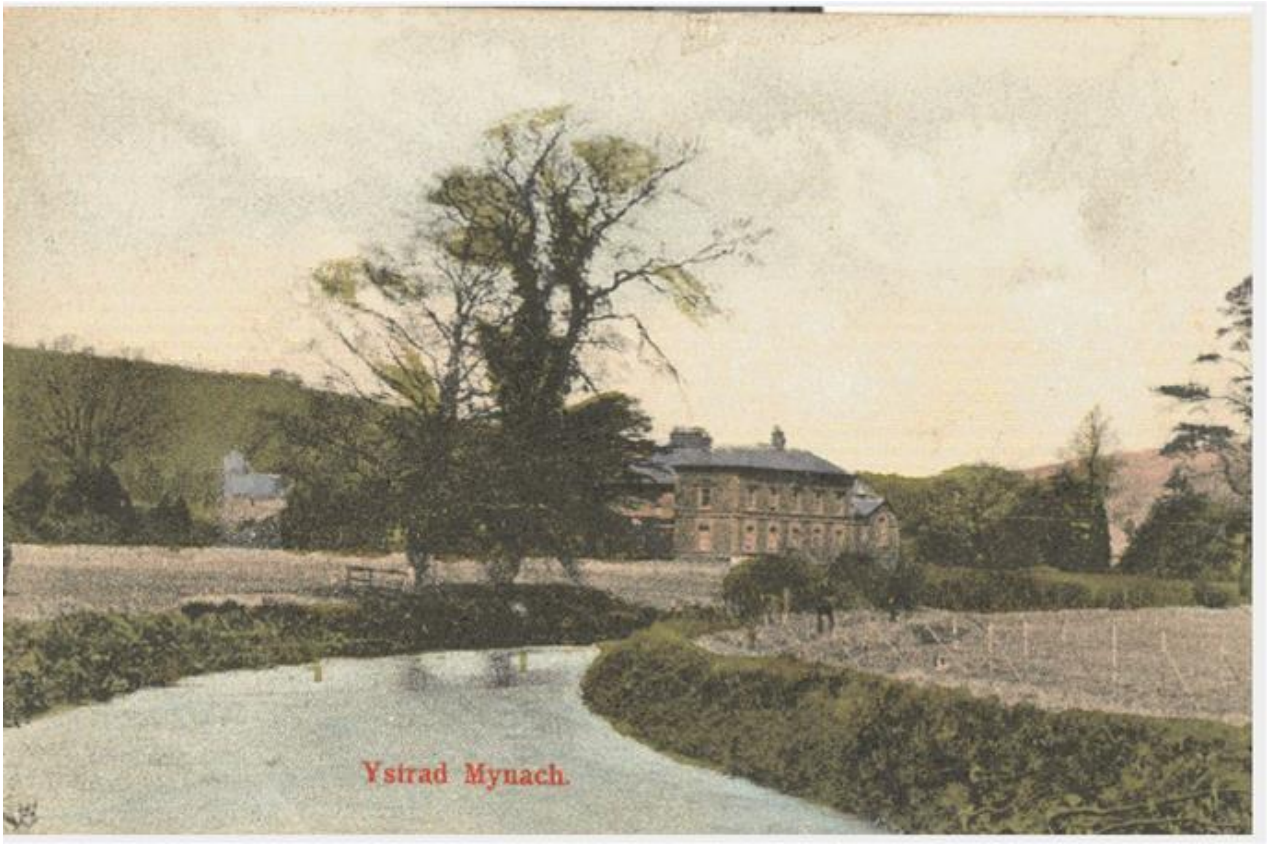
Redacted

Thank you for considering to take part in this research project. If you decide to participate, please retain this Participant Information Sheet for your records

Appendix M

Old Ystrad house photos





Appendix N

Green space project website and social media links

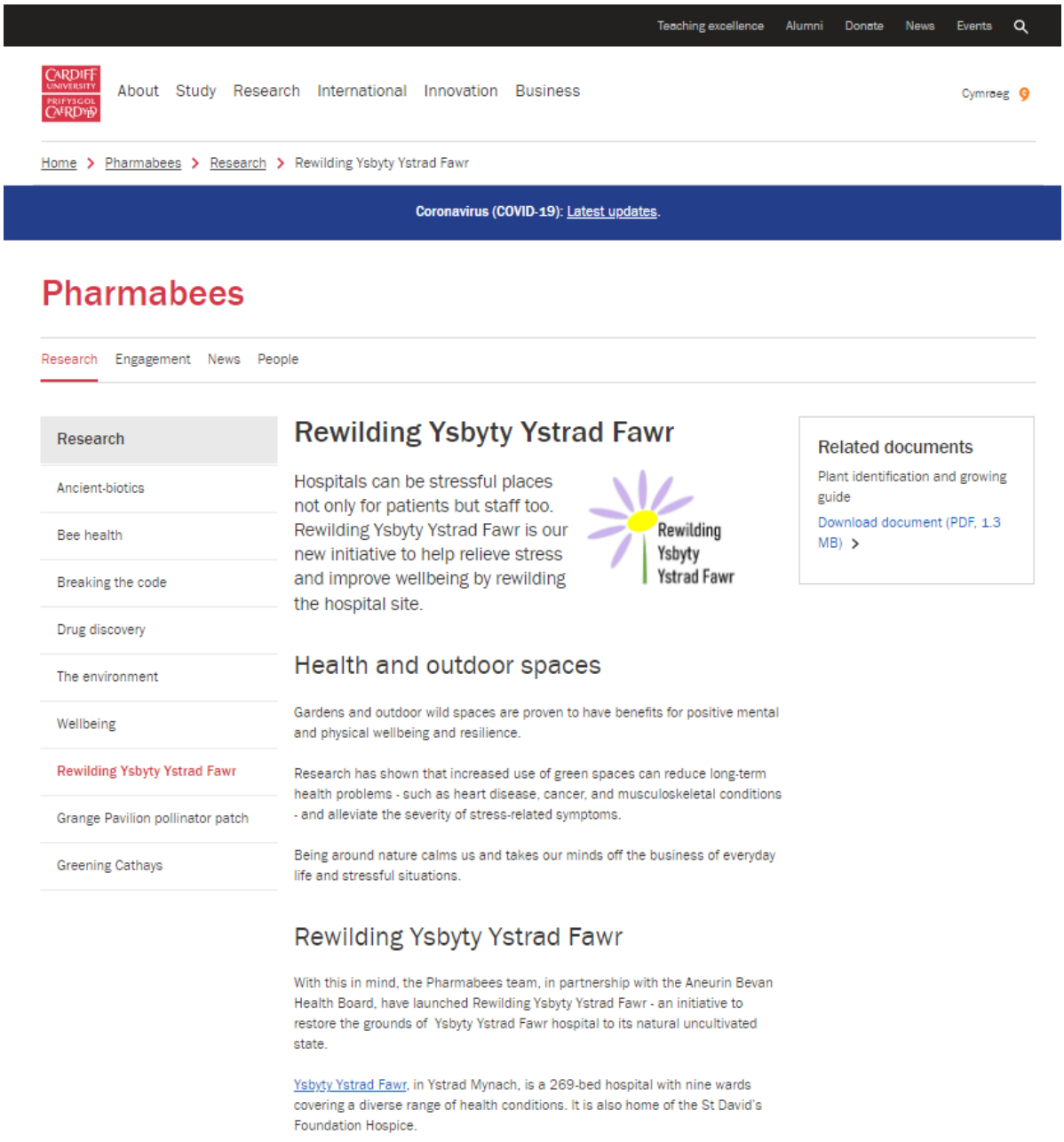
https://www.cardiff.ac.uk/pharmabees/research/rewilding-ysbyty-ystrad-fawr

https://www.cardiff.ac.uk/cy/pharmabees/research/rewilding-ysbyty-ystrad-fawr

https://www.facebook.com/Rewilding-Ysbyty-Ystrad-Fawr-102691771316857/

https://www.instagram.com/rewilding_ysbyty_ystrad_fawr/

https://twitter.com/RewildingYYF



This new site has been landscaped to be low maintenance and enjoyable to people in the hospital, rather than to support nature.

Wildflower species

So far rewilding the grounds of Ystrad Fawr has seen the growth of a range of pollinator-friendly native wildflowers such as:

- common knapweed
- meadow buttercups
- oxeye daisy
- white campion
- dandelion
- cuckoo flower
- white gem
- corncockle
- white clover
- bluebells
- forget me nots
- cowslip
- red clover
- wild sweet pea

Ladies smock (cuckoo flower) wildflowers growing at Ysbyty Ystrad Fawr.

You can find out more information about these wildflowers from the Woodland Trust and the Wildlife Trust. If you want to grow your own wildflowers with our Pharmabees seed mix please see our plant identification guide (PDF).

Benefits

The wildflowers are currently growing around the border of the hospital grounds and benches will be placed so that staff and visitors can enjoy the rewilding.

Biodiversity

This scheme will attempt to increase biodiversity and reduce carbon emissions. By offering a safe haven and food source for local pollinators, rewilding areas allows insects to move out of woodland into sunnier spaces feeding on the nectar of wildflowers.

With pollinator populations on the decline creating diverse habitats is essential to safeguard these vital members of the ecosystem.

Climate change

Carbon offsetting is reducing greenhouse gases in the most cost efficient way by allowing the growth of vegetation that draws carbon dioxide out of the atmosphere via plant photosynthesis.

In doing so this project will also help play a role in the fight against climate change. According to research by the Grassland Trust, grasslands can draw down and store up to 3 tonnes more carbon per hectare (10,000m squared) each year than standard turf.

Wellbeing

Rewilding the grounds of Ysbyty Ystrad Fawr is not only good for the environment but will also be good for staff and visitors who can enjoy the green space outside.

A unique aspect to this rewilding project is that in addition to enhancing the flora and fauna of the local area, we will also be developing an approach with which to measure the impact of spending time in nature on the personal wellbeing of NHS staff.

Once developed, our hope is that this tool will be used to assess the impact of similar projects across Wales.

Get involved

Take part in Pharmabees projects, and rewild at home:

- Spot a Bee
- BioBlitz Survey
- Wildflower Growing Guide and Plant ID.

Contact us

Redacted

Follow us

- Twitter
- Instagram
- Facebook

Appendix O

Ethics for social media

SPPS Amendment Approval Notification (AAN) 11/10/14 v1

Cardiff School of Pharmacy and Pharmaceutical Sciences, Research Ethics Approval

AMENDMENT APPROVAL

This form has been signed by the School Research Ethics Officer as evidence that approval has been granted by the Cardiff School of Pharmacy and Pharmaceutical Sciences Research Ethics Committee for amendment(s) to the following study:

Project ref and title:	1819-25: Bee Well Caerphilly

Redacted

The amendment(s) dated 1 June 2020 have been reviewed and approved.

Any further amendments will require approval.

STATEMENT OF ETHICS APPROVAL

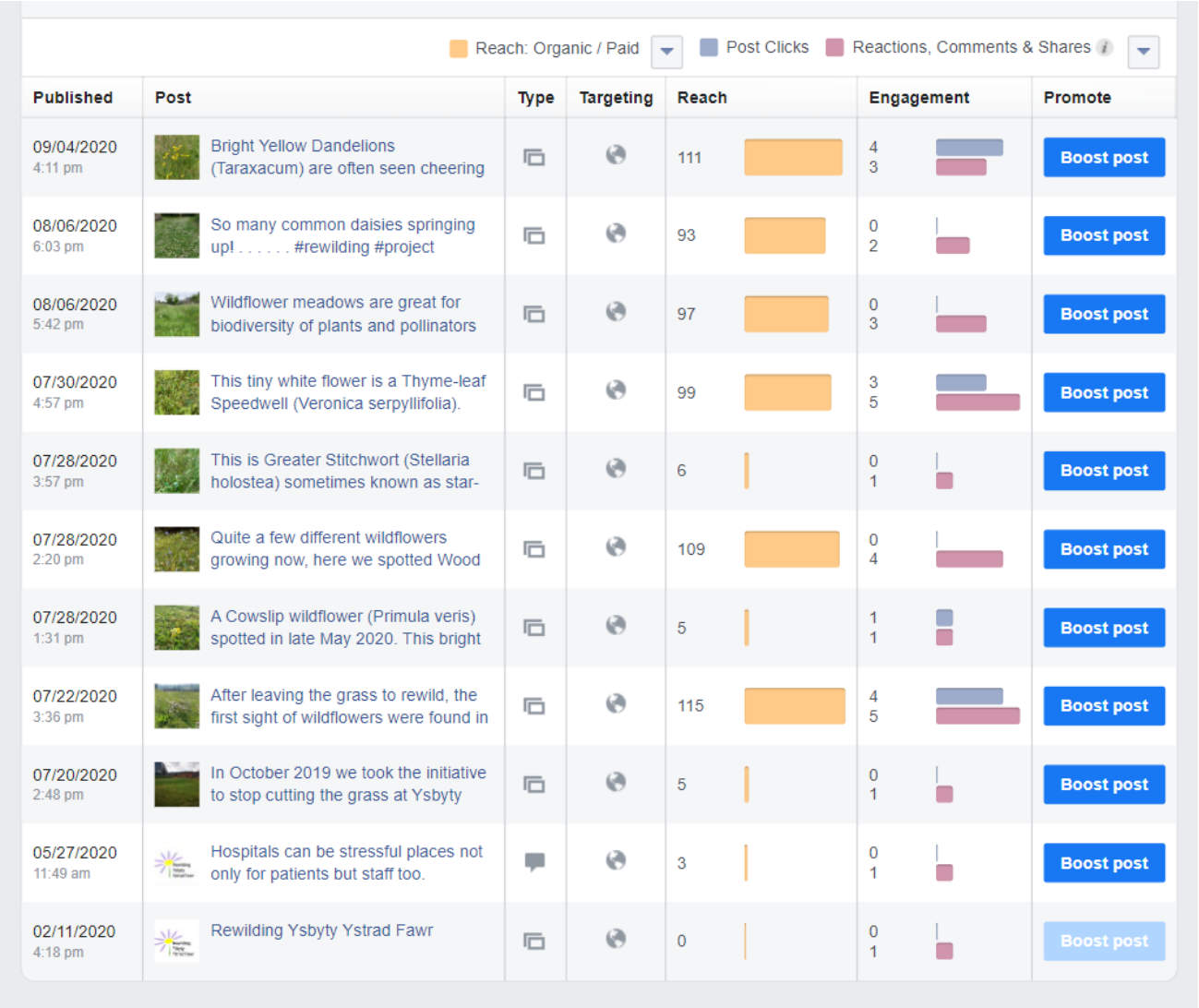
The proposed amendment(s) have been considered and approved by the Cardiff School of Pharmacy and Pharmaceutical Sciences Research Ethics Committee

Redacted

(Chair, School Research Ethics Committee)

Appendix P

Facebook media analytics



Reach: Organic / Paid | Post Clicks | Reactions, Comments & Shares

Published	Post	Type	Targeting	Reach	Engagement	Promote
09/04/2020 4:11 pm	Bright Yellow Dandelions (Taraxacum) are often seen cheering			111	4 3	Boost post
08/06/2020 6:03 pm	So many common daisies springing up! . . . . . #rewilding #project			93	0 2	Boost post
08/06/2020 5:42 pm	Wildflower meadows are great for biodiversity of plants and pollinators			97	0 3	Boost post
07/30/2020 4:57 pm	This tiny white flower is a Thyme-leaf Speedwell (Veronica serpyllifolia).			99	3 5	Boost post
07/28/2020 3:57 pm	This is Greater Stitchwort (Stellaria holostea) sometimes known as star-			6	0 1	Boost post
07/28/2020 2:20 pm	Quite a few different wildflowers growing now, here we spotted Wood			109	0 4	Boost post
07/28/2020 1:31 pm	A Cowslip wildflower (Primula veris) spotted in late May 2020. This bright			5	1 1	Boost post
07/22/2020 3:36 pm	After leaving the grass to rewild, the first sight of wildflowers were found in			115	4 5	Boost post
07/20/2020 2:48 pm	In October 2019 we took the initiative to stop cutting the grass at Ysbyty			5	0 1	Boost post
05/27/2020 11:49 am	Hospitals can be stressful places not only for patients but staff too.			3	0 1	Boost post
02/11/2020 4:18 pm	Rewilding Ysbyty Ystrad Fawr			0	0 1	Boost post

Appendix Q

Follow up interview - recruitment email

The email advertising participants will contain the following text:

Email subject title: Your views needed, The Green space project at YYF

Dear Colleague,

Research has suggested that spending even short periods of time in a green space (defined as a vegetated space in an urban area) can lower stress and have beneficial effects on people's wellbeing and health. This green space project at Ysbyty Ystrad Fawr to create a green space for staff, patients and visitors to use was created in light of this research.

Our original project plan has been disrupted by the Covid-19 and the creation of the green space could not go forward as we originally planned.

We would like to carry out interviews as a way to obtain critical feedback gathering your opinions and experiences of the Green space creation project and especially as a way to discuss ideas for the project in the future so that the green space can be sustainably kept and may develop at the Hospital

This will involve an online interview within which you will be asked about your experiences of the green space project and given an opportunity to discuss future project ideas for green space development.

The interview will last approximately 30 to 45 minutes and will be guided by the researcher. It is planned that the interview will be carried out using Microsoft Teams.

Redacted

Appendix R

Follow up interview with NHS staff

PARTICIPANT INFORMATION SHEET

INVESTIGATING THE ASSOCIATION BETWEEN SUBJECTIVE WELLBEING AND GREEN SPACE: GREEN SPACE FOLLOW UP INTERVIEW

You are being invited to take part in a follow up interview from the green space project at Ysbyty Ystrad Fawr. Before you decide whether or not to take part, it is important for you to understand why the research is being undertaken and what it will involve. Please take time to read the following information carefully and discuss it with others, if you wish.

Thank you for reading this.

1. What is the purpose of this research project?

Research has suggested that spending even short periods of time in a green space (defined as a vegetated space in an urban area) can lower stress and have beneficial effects on people's wellbeing and health. This green space project at Ysbyty Ystrad Fawr to create a green space for staff, patients and visitors to use was created in light of this research.

Our original project plan has been disrupted by the Covid-19 and the creation of the green space could not go forward as we originally planned. We would like to carry out these interviews as a way to obtain critical feedback gathering your opinions and experiences of the Green space creation project and especially as a way to discuss ideas for the project in the future, so that the green space can be sustainably kept and develop at the Hospital.

2. Why have I been invited to take part?

You have been invited to take part in this study because You are an NHS staff member at Ysbyty Ystrad Fawr that has been involved in the green space creation project

3. Do I have to take part?

No, your participation in this research project is entirely voluntary and it is up to you to decide whether or not to take part. If you decide to take part, we will discuss the research project with you and ask you to sign a consent form. If you decide not to take part, you do not have to explain your reasons and it will not affect your legal rights.

You are free to withdraw your consent to participate in the research project at any time, and your data can be withdrawn as long as it before transcripts of the interviews are transcribed and anonymised.

Version 2 December 2020

4. **What will taking part involve?**

This will involve an online interview within which you will be asked about your experiences of the green space project and given an opportunity to discuss future project ideas for green space development.

If express your wish to take part in these interviews, the student researcher will be in contact to arrange the online interview and to request online consent. The interview will last approximately 30 to 45 minutes and will be guided by the researcher. It is planned that the interview will be carried out using Microsoft Teams. If you do not have access to this software or would prefer to be interviewed over the telephone you can let the researchers know when we are arranging the interview. The participant may choose whether they want to have their camera on or off.

The interview will be audio-recorded with a portable Dictaphone with your consent, and then will be transcribed, at which point any information that might identify you as an individual will be removed. The audio recording will be deleted from the Dictaphone after this transcription takes place, anonymising the data.

5. **Will I be paid for taking part?**

No, participation is voluntary and there is no payment.

6. **What are the possible benefits of taking part?**

There are no immediate benefits to participants in this study, however, the results from this research will gather ideas for the future of the green space project.

7. **What are the possible risks of taking part?**

There is a time commitment involved with taking part in this follow up interview. There are no anticipated disadvantages, risks or burdens associated with taking part, apart from the stated time commitment.

8. **Will my taking part in this research project be kept confidential?**

All information collected from (or about) you during arranging the interview will be kept confidential and any personal information you provide will be managed in accordance with data protection legislation. Please see 'What will happen to my Personal Data?' (below) for further information.

9. **What will happen to my Personal Data?**

The personal data that will be collected in the follow up interview will be, your consent form, email address and the audio recording of the interview. If the interview is over the telephone, then your contact number will also be classed as personal.

Any email correspondence between you and the researcher and the record of the organised Microsoft Teams meeting or any record of your contact telephone number (I.e. the interview) will be handled confidentially and deleted after the interview has taken place.

The electronic consent form will be signed and dated as a word document once completed this should be emailed back to the research interviewer.

The audio recording on the portable dictaphone will be kept in a locked drawer only accessible to the research team and will be destroyed after the interview has been transcribed. Please note that all identifiable data will be anonymised when the interview is transcribed and all quotes and excerpts will be anonymised in research publications. Please note that after the interview has been transcribed we will be unable to identify and remove your data should you wish to withdraw your data.

Other personal data we collect, such as your consent form will be stored securely in a locked drawer or password-protected computer and will be retained for no longer than one year after the end of the study and may be accessed by members of the research team and, where necessary, by members of the University's governance and audit teams or by regulatory authorities.
Cardiff University is the Data Controller and is committed to respecting and protecting your personal data in accordance with your expectations and Data Protection legislation. Further information about Data Protection, including:

- your rights
- the legal basis under which Cardiff University processes your personal data for research
- Cardiff University's Data Protection Policy
- how to contact the Cardiff University Data Protection Officer
- how to contact the Information Commissioner's Office

maybe found at https://www.cardiff.ac.uk/public-information/policies-and-procedures/data-protection

Cardiff University will not share any personal data or non-anonymised data.

Your online consent will be retained from time of collection for no longer than one year after the end of the study and may be accessed by members of the research team and, where necessary, by members of the University's governance and audit teams or by regulatory authorities. Anonymised information will be kept for a minimum of December 2020 to February 2021 but may be published in support of the research project and/or retained indefinitely, where it is likely to have continuing value for research purposes.

Participants may withdraw from the study at any time and data collected may be withdrawn at any time up until the transcribing period, approximately 1 week after the interview. From this point participant's' data will be fully anonymised and therefore impossible to withdraw.

Redacted

10. What happens to the data at the end of the research project?

The data collected during this interview will be used to plan future developments of the onsite green space. At the end of the study, the data will be shared within the university but will be restricted to the researchers of this future project. Any personal or identifiable data will be removed before this sharing takes place.

11. What will happen to the results of the research project?

The data and results of this project will be included in an MPhil thesis and potentially research publications and presentations/posters at research conferences. You will not be identified in any of these documents/presentations, although anonymised quotes from the interviews may be included. If you wish to receive electronic copies of these documents, please contact the researcher to be included on our circulation list.

12. What if there is a problem?

If you wish to complain or have grounds for concerns about any aspect of the manner in which you have been approached or treated during the course of this research, please contact the researcher If you are unhappy with how the project is being conducted, please contact a member of the research team using the contact information at the end of this document. If you feel your complaint has not been handled to your satisfaction and wish to complain formally, you can do this by contacting the Director of Research, Cardiff School of Pharmacy and Pharmaceutical Sciences, Redwood Building, King Edward VII Avenue, Cardiff CF10 3NB,

If you are harmed by taking part in this research project, there are no special compensation arrangements. If you are harmed due to someone's negligence, you may have grounds for legal action, but you may have to pay for it.

13. Who is organising and funding this research project?

Redacted

14. Who has reviewed this research project?

This research project has been reviewed and given a favourable opinion by the School of Pharmacy and Pharmaceutical Sciences Research Ethics Committee, Cardiff University.

15. Further information and contact details

Should you have any questions relating to this research project, you may contact us during normal working hours:

Redacted

Thank you for considering to take part in this research project. If you decide to participate, please retain this Participant Information Sheet for your records

Appendix S

Consent form – follow up interviews

Research project title: Bee Well Caerphilly
SREC reference: 1819-25

Consent will be gained electronically. This electronic consent form will be presented as shown below and will be singed and emailed back to the research interviewer.

INVESTIGATING THE ASSOCIATION BETWEEN SUBJECTIVE WELLBEING AND GREEN SPACE: GREEN SPACE FOLLOW UP INTERVIEW

Follow up interview – Consent Form

	Please tick box
I confirm that I have read the follow up interview information sheet dated December 2020 for the above phase of the study.	
I confirm that I have understood the information sheet dated information sheet dated December 2020 and that I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	
I understand that my participation is voluntary and I am free to withdraw at any time without giving a reason and without any adverse consequences (e.g. to medical care or legal rights, if relevant). I understand that if I withdraw, information about me that has already been obtained past the interview transcription stage may be kept by Cardiff University.	
I understand that data collected during the research project may be looked at by individuals from the Cardiff University Research team or from regulatory authorities, where it is relevant to my taking part in the research project. I give permission for these individuals to have access to my data.	
I consent to the processing of my personal information [This consent form, your contact details and the audio recording of this interview] for the purposes explained to me. I understand that such information will be held in accordance with all applicable data protection legislation and in strict confidence, unless disclosure is required by law or professional obligation.	
I understand who will have access to personal information provided, how the data will be stored and what will happen to the data at the end of the research project.	
I understand that after the research project, anonymised data may be used to determine feasibility of another project measuring the impact of spending time in the green spaces on Hospital staff wellbeing. I understand that at the end of the study the data will be shared within the university but will be restricted to the researchers of this future project. I understand that it will not be	

Version 2 (December 2020)

possible to identify my data and that my data will be used by other researchers, for ethically approved research projects, on the understanding that confidentiality will be maintained.	
I consent to being audio recorded for the purposes of the research project and I understand how it will be used in the research.	
I understand that anonymised excerpts and/or verbatim quotes from my interview may be used as part of the research publication.	
I understand how the findings and results of the research project will be written up and published.	
I agree to take part in this research project.	

Please type your name and date into the box below to confirm consent to participate:

Name: Date:

THANK YOU FOR PARTICIPATING IN OUR RESEARCH

Version 2 (December 2020)

Appendix T

Follow up interview with NHS staff - topic guide

INVESTIGATING THE ASSOCIATION BETWEEN SUBJECTIVE WELLBEING AND GREEN SPACE: GREEN SPACE FOLLOW UP INTERVIEW

Follow up interview

If participants express interest in follow up interviews after reading the information sheet, (Version 1 Dec 2020) The researcher will then contact the individual to gain online consent, arrange the interview

The interviews will be conducted over online video call, Microsoft teams or whatever works best for the interviewee, and will be recorded.

Introduction

Thank you for agreeing to take part in this follow up interview

As you'll have seen in the information sheet Our original project plan has been disrupted by the Covid-19 and the creation of the green space could not go forward as we originally planned.

Here we would like to carry out these interviews as a way to obtain critical feedback gathering your opinions and experiences of the Green space creation project and especially as a way to discuss ideas for the project in the future.

As the green space is a work in progress, we want to know your experience of using the space yourself when possible and what you would like as part of the future development of the site.

Please let me know at any point during the session if there is anything you feel uncomfortable with and remember that you don't need to answer any questions that you don't want to. The session will last approximately 30-45 minutes. It will be recorded with a voice recorder *(subject to consent)* to make sure I don't miss any of the information you provide but your identity will be kept confidential, so don't be afraid to speak to me openly.

Topic Guide

Planning period

Discuss the planning of the green space from the timeline of October 2019 to March 2020.

Difficulties

Discuss pitfalls faced during the planning period

What proved to be difficult or impossible when it came to developing the green space

Discuss how the green space is able to be used given the precautions that must be taken in the COVID-19 pandemic

Benefits

What do you think has been good about the green space so far?

What do you think would be good for the green space development in the future?

How did you use the green space?

How would you like the green space to be used?

Will the green space development be beneficial to people in the hospital as a developing project?

Promotion of the green space

Discuss ideas for promotion of the green space to everyone onsite

Discuss, social media, posters and signs.

Future ideas

Discuss future plans for the green space

What would you like to see this space develop into?

How would you think green space would benefit staff that work onsite?

Long term, how can we ensure this is a sustainable project that thrives and continues to develop?

Closing

Thank you for answering my questions and for the discussion.

Is there anything else relating to this topic that you wanted to say but haven't had the chance?

If yes, then explore and check if anything else to add after this.

Explanation of what will happen to personal data and data given in this interview.

Thank you and goodbye